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ABSTRACT

This guide for the fiscal year 1976 is designed to provide summary information about programs funded by the National Science Foundation, and is intended as a source of general guidance for institutions and individuals interested in participating in these programs. Program listings describe the principal characteristics and basic purpose of each activity, eligibility requirements, closing dates (where applicable), and the address from which more detailed information, brochures, or application forms may be obtained. (Author)

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National Science Foundation Guide to Programs

Fiscal Year 1976

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Discrimination Prohibited

In accordance with Federal statutes and regulations, no person shall, on grounds of race, color, age, sex, or national origin, be excluded from participation in or denied the benefits of, or be subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

Individual brochures with complete information about programs with application deadlines described in this Guide are made available as soon as possible during the fiscal year. Announcements of their availability and of program deadlines are published in the monthly *NSF Bulletin*, which is distributed free by NSF. To receive it, write: Editor, *NSF Bulletin*, Public Information Branch, National Science Foundation, Washington, D.C. 20550.

Guide to Programs

National Science Foundation

FISCAL YEAR 1976

Introduction

The National Science Foundation is an agency of the Federal Government established in 1950 to advance scientific progress in the United States. The Foundation fulfills this responsibility primarily by sponsoring scientific research, encouraging and supporting improvements in science education, and fostering scientific information exchange. NSF does not itself conduct research or carry out education projects.

The Foundation supports scientific research and education projects in the mathematical, physical, medical, biological, social, and engineering sciences. The Foundation does not support projects in clinical medicine, the arts and humanities, business areas, or social work.

The National Science Board is the policymaking body of the National Science Foundation. It consists of 25 members appointed by the President, by and with the consent of the Senate, and includes the Director of the Foundation who serves on a full-time basis. The Board passes on new Foundation programs and on grants or contracts requiring a total commitment of more than $2 million or an annual expenditure of more than $500,000.

Proposals for support are ordinarily assigned to the appropriate division or office for review and evaluation. An organization chart depicting the major areas of program activity is provided on page 77.

In making its decisions on proposals, the Foundation relies heavily on the advice and assistance of advisory panels, outside reviewers, and other experts to ensure that NSF is able to reach fair and knowledgeable judgments. These scientists and educators come from colleges and universities, from nonprofit research and educational organizations, from industry, and from other Government agencies. Their counsel has proven invaluable to the Foundation.

The National Science Foundation Act of 1950, as amended, permits the Foundation to support basic research, without restriction as to the type of performer. It also permits the support of applied research at academic and other nonprofit institutions. By letter to the Director of April 13, 1972, and pursuant to the authority of Section 3(c) of the Act, the President extended the applied research authority in the following terms:

> The Foundation, in making grants or contracts for applied scientific research relevant to national problems involving the public interest, may support such work at other than academic and nonprofit institutions when the Director of the National Science Foundation determines that it would

be advantageous to use the capabilities of such other institutions to accomplish the program objectives.

Within the limits of this Directive, it is the policy of the National Science Foundation to support research at industrial or commercial organizations when it is advantageous for the attainment of its program objectives. The Director of the Foundation has determined in which research program areas industrial and commercial organizations will be encouraged to participate, and has approved the criteria for participation in the program.

The Foundation will continue to emphasize its traditional role of support for a strong national basic research capability, particularly in academic institutions, and the improvement of science education. At the same time, the participation of individual industry and other nonacademic organizations is encouraged generally in the RANN (Research Applied to National Needs) program.

Also, collaboration between industry and university researchers, as well as between industry and State or local governments, on appropriate programs is encouraged. Similarly, broader efforts through industry associations, groups of companies, or professional societies may be supported. Prospective proposers are encouraged to contact the appropriate program for program announcements and brochures and for preliminary discussions and guidance prior to the submission of a proposal.

Generally, awards are made in response to both solicited and unsolicited proposals. Normally, awards resulting from unsolicited research proposals are made on a cost-sharing or jointly funded basis while those from solicited proposals may provide for payment of full costs including fee. Proposals in response to specific program announcements are considered solicited only when the announcement so indicates.

Disposition of rights to data and inventions resulting from Foundation-supported research are subject to negotiation. Factors to be considered are the nature and purpose of the project and other factors involving the public interest, the commercial position of the awardee, and any equities he may have. At a minimum the Government will receive a royalty-free, paid-up license and the right to require the licensing of others on reasonable terms in certain circumstances.

The National Science Foundation looks forward to being able to utilize and properly integrate the capabilities of all institutions in the support of science and its contribution to society and the Nation.

Criteria for the Selection of Research Projects

The National Science Foundation administers several different programs of research support corresponding to several legislatively assigned objectives. To the maximum degree possible, these activities are designed to utilize and enhance existing scientific research potential and institutions. Purposeful adjustments are made when indicated.

In the selection of individual projects a number of widely understood and acknowledged criteria are considered. In different programs, the different criteria must be assigned different weights, according to the objectives being pursued. Also these criteria relate in different ways to the distinctive characteristics of different types of research-performing organizations.

INTRODUCTION

Policy Context

Public support of scientific research, specifically including basic research, is an accepted feature of U.S. public policy. Such support has two recognized major objectives:

- To foster and maintain basic research as an investment toward future opportunities, as insurance against unforeseeable future dangers, and as a vital element of culture;
- To bring about prompt, effective performance of applied research and problem-oriented basic research—insofar as specific needs for these can be foreseen—in the light of current understanding.

The National Science Foundation

It is not possible to make the distinction between basic and applied research a sharp one, and the Foundation is one of several Federal agencies that supports research of both kinds. The Foundation, however, is unique in its mission to foster basic research *per se* and in its responsibility for future scientific research capability. Thus the National Science Foundation Act of 1950, as amended, authorizes "programs to strengthen scientific research potential" as well as "scholarships and graduate fellowships." The Act authorizes support both of basic and of applied research and—in combination with Presidential directive—use of an unrestricted range of performers.

Agency Objectives and Methods

The Foundation thus has been charged with advancing several different but interrelated major objectives:

- Accomplishment of basic research;
- Accomplishment of applied research in selected areas;
- Long-term maintenance and strengthening of potential to accomplish both basic and applied research in the future.

This range of objectives has been reflected in the development of several different program formats for NSF support of research. But despite the approximate correspondence of programs to objectives, it remains true that research support actions are often taken with more than a single end in view. Thus the Foundation's method of pursuing any one objective may be modified or restricted by consideration of the others.

Functions Performed

Where research support is concerned, functions performed by the Foundation include:

— Allocation of resources to fields of science, to classes of scientific activity, or to areas of application;

— Selection of individual projects to be supported;

— Direct establishment or adjustment of institutional structures or capabilities.

CRITERIA

Allocation of resources to fields of science and to areas of application is not further discussed in this notice, but many of the criteria for individual project selection require only slight modification for use at the higher level of aggregation. Criteria for the creation or modification of institutional structures are dealt with in a separate section.

The following is an enumeration of criteria employed in the selection of research projects. To simplify later discussion, they are grouped in four categories.

Category A

Criteria relating to competent performance of research—the technical adequacy of the performer and of his institutional base:

1. The scientist's training, past performance record, and estimated potential for future accomplishment;
2. The scientist's demonstrated awareness of previous and alternative approaches to his problem;
3. Probable adequacy of available or obtainable instrumentation and technical support.

Category B

Criteria relating to the internal structure of science itself:

4. Probability that the research will lead to important discoveries or valid, significant, and conceptual generalizations within its field of science or (in the most favorable cases) extending to other fields as well;

5. Probability that the research will lead to significant improvements or innovations of investigative method—again with possible extension to other fields of science.

Category C

Criteria relating to utility or relevance:

6. Probability that the research can serve as the basis for new invention or improved technology;

7. Probable contribution of the research to technology assessment—i.e., to estimating and predicting the direct and indirect, intended and unintended effects of existing or proposed technologies;

8. Identification of an immediate programmatic context and user of the anticipated research results.

Category D

Criteria relating to future and long-term scientific potential of the United States:

9. Probable influence of the research upon the capabilities, interests, and careers of participating graduate students, postdoctoral associates, or other junior researchers;

10. Probability that the research will lead to radiation and diffusion, not only of technical results, but also of standards of workmanship and a tradition of excellence in the field;

11. Anticipated effect upon the institutional structure of U.S. science.

Because none of these considerations is susceptible to precise quantification, or even in most cases to unambiguous rank ordering, it would be more accurately descriptive to speak not of "criteria" but rather of "factors considered." Moreover, very different relative weights must be attached to the different factors in the case of different agency objectives or programs, as is explained in a later section.

Discussion

The first three criteria—those relating to competent execution—are given first consideration in every program. Every NSF-supported project is expected at the least to produce some valid new information or relationships. The best way to ensure this is to insist upon competent scientists and adequate facilities. All

other considerations which follow then, are predicated upon the assumption that these first three criteria are universally applied and that competent performance will be the normal expectation.

Criteria 4 and 5—those relating to the internal structure of science—summarize succinctly what the scientific community understands by the phrase "intrinsic scientific merit."

Criteria 6 and 7—those relating to utility or relevance—cannot be made entirely distinct from the preceding two, since that science judged best by internal standards has almost invariably turned out in the long run to be the most useful. Valid generalizations and powerful methods of observation and measurement usually lead to new invention, improved technology, and more confident assessment. Conversely, applied investigations designed to support invention, technology, and assessment tend to succeed in these purposes to the extent that they do uncover valid generalizations or improved methods. Thus differences between the two types of criteria are mainly ones of motivational specificity and time horizon. Research is properly termed "applied" when we visualize using the results in a very specific context—usually defined in terms of some already-formulated systems concept—or when we expect it will prove diagnostic of some already-recognized problem.

This specific relationship of applied research to a particular systems concept and plan of development is made still more explicit in criterion 8.

Criteria 9, 10, and 11—those relating to long-term scientific potential—address not so much the content of the research as the circumstances under which it is performed. They include, of course, the quality of training of scientists, but extend beyond this to the processes of scientific communication and publication, the evolution of traditional scientific disciplines, the spawning of new "interdisciplinary" disciplines, the manner in which scientific careers are developed, the organizational structures and settings in which all this goes on, and in general how the scientific tradition and the living corps of scientific capability of our Nation are maintained. While these criteria are seldom dominant in project selection or program development, they are always considered. The policy of the Foundation is not to undertake for short-term reasons any action which would seriously jeopardize the long-range science potential of the Nation.

RELATIONSHIP TO SOME CHARACTERISTICS OF RESEARCH-PERFORMING ORGANIZATIONS

NSF policy is to use and reinforce proven strengths of U.S. scientific institutions. These institutions include organizations of different types, such as:

- Universities and colleges;
- Industrial research laboratories and in-house laboratories of Federal agencies;
- National Centers and other federally funded research centers;

- Vendors of R&D services.

The Foundation seeks to avoid inadvertently changing the characteristics of proven organizations—either through individual actions, or as the cumulative result of many actions. Purposeful changes may occasionally be encouraged for specific reasons. Some relevant characteristics of the different types of organization include the following:

- Universities and colleges (academic institutions proper) have as their two principal missions teaching and the development and propagation of new knowledge and understanding. As applied to these organizations, therefore, criteria 9 and 10 may be regarded as criteria of "mission relevance."

- Academic organizations, traditionally, are deeply committed to considerations of intrinsic scientific merit (criteria 4 and 5) in developing and selecting their own research programs. This is largely a consequence of peer evaluation and peer pressure exerted upon the individual scientist.

- Organization along disciplinary lines is a prominent feature of academic research tradition. This is an indispensable virtue insofar as it guarantees comprehensive peer evaluation of scientific research results, but it presents some limitations for problem-oriented research. It should be borne in mind that new disciplines emerge from time to time and that the focus of established disciplines evolves continually.

- Academic environments also tend to place extreme value upon originality, methodological elegance, and upon the initiative and scientific judgment of the individual investigator. This characteristic again presents some limitations for problem-oriented research.

- Industrial research laboratories and Federal agencies' in-house laboratories generally have as their mission the generation of new knowledge and understanding in areas judged to be of immediate or potential concern and use in carrying out the commercial activities of the parent company or the mission of the agency.

- National Centers and federally funded research centers have as their mission the generation of new knowledge and understanding judged to be needed or desirable in the public interest. These organizations are generally established to provide specialized research environments not readily obtainable in organizations of the other types.

- Vendors of R&D services include many of the "not-for-profit" R&D organizations and also a number of—usually more specialized—R&D companies. These organizations, in addition to maintaining some level of independent research, are unique in the extent to which they undertake contract research on topics and problems designated by outside purchasers. Collectively they constitute a reservoir of general purpose research capability for hire.

Discussion

Different factors tend to determine the scope and complexion of the research programs in the different types of organizations. Thus universities tend to be complement limited. For them the primary management decision is how many professional staff (faculty) to employ and which particular ones. Subsequently, these individuals determine program content. Industrial and mission agency in-house laboratories are "mission determined." That is, activity is weighed and selected according to mission requirements. Finally, R&D vendors are, at least to some extent, capability and market limited. Foundation policy is to recognize and, generally, to avoid disturbing these characteristic differences.

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I. Scientific Research Projects

Programs described in Chapter I are administered in several different directorates of the Foundation through more than 90 individual program offices.

The National Science Foundation provides project support for research in all of the sciences, including engineering, mathematics, and computer research. The Foundation further assists universities to procure specialized research facilities and equipment, and in the support of research workshops, symposia, and conferences. The majority of requests are submitted by U.S. universities and colleges on behalf of individual scientists or groups of scientists on their faculties. Foundation policy emphasizes research that also contributes to graduate and postdoctoral education in the sciences. Support of research at foreign institutions is provided only when it is clearly in the interest of science in the United States.

Research project proposals are considered primarily on the basis of scientific merit. Scientific merit is assessed according to the promise of significant scientific results, the possible scientific impact, and the probable opening of a new field.

Scientific Research Projects

The support of individual research projects in fundamental science has the objective of increasing our store of knowledge in all fields of science and enhancing our understanding of the scientific aspects of major problems confronting the Nation. Most of the research supported is basic in character, although some work of a more applied nature is also supported. Through this program, support may also be provided for research workshops, symposia and conferences, and for the purchase of scientific equipment.

Grants normally provide support for periods up to 24 months. To provide reasonable assurance of long-term support for continuing projects of high scientific merit, approval may be provided for periods up to 60 months with funding provided in annual increments contingent upon the availability of the funds and satisfactory progress of the research.

Institutions are required to share in the cost of each unsolicited research project supported by an NSF grant or contract. Before submitting a proposal for research project support, the brochure *Grants for Scientific Research* should be consulted for guidance in preparing the application. A recommended format is provided in the brochure, but standard application forms are not required.

Eligibility

The principal recipients of support under this program are academic institutions and institutions closely associated with advanced research training. In special circumstances, grants may also be awarded to other types of institutions and to individuals. In these cases, preliminary discussion with the Foundation is recommended. Support may be provided to projects involving a single scientist or to projects covering the activities of a number of scientists. While most projects are confined to a single disciplinary area, awards also are made for projects which cross or merge disciplinary interests.

Deadlines

Proposals may be submitted at any time. Approximately 6 months should be allowed for consideration of a proposal.

Additional Information

The range of scientific project support activity is summarized as follows:

Biological Sciences (excluding clinical aspects)

- **Cellular Biology**—Supports studies on the development of living things and their genetic and hereditary characteristics. A special program on understanding the human cell is also supported.

- **Ecology and Population Biology**—Supports basic research in systematics, population genetics, evolution, and ecological sciences mainly as applied to naturally occurring populations of plants and animals. Supports individual projects in population and physiological ecology as well as large integrated studies of terrestrial and freshwater ecosystems.

- **Biological Research Resources**—Supports museum research collections, herbaria, stock centers for living organisms, and field research facilities.

- **Molecular Biology**—Supports research on structures, interactions, and functions of living systems at the molecular level.

- **Physiological Processes**—Supports studies in the metabolism of organisms and on the function and interaction of organ systems in plants and animals.

- **Psychobiology and Neurobiology**—Provides support for studies on human and animal behavior, and for research dealing with any aspect of the central nervous system.

Chemistry—Supports research in the properties, structure, and transformation of matter.

Computer Research—Support is provided for basic research relating to the foundations and fundamental structure of the science of computing and the principles underlying the design of computer hardware and software systems. Also supported is work directed to the advancement of research methodology in scientific disciplines through the use of computer science and technology; and studies pertaining to the role of the computer in a broad spectrum of societal issues, such as privacy, human-machine interfaces, and energy-related computer modeling.

Engineering—Support is provided in the following major subject areas:

- **Electrical Sciences and Analysis**—Supports research in the general area of electrical engineering, including operations, research, systems engineering, biomedical engineering, devices, control, and communications systems.

- **Engineering Chemistry and Energetics**—Supports research related to the technological development and economic growth of the chemical process, energy conversion, and related industries.

- **Engineering Mechanics**—Provides support for studies in solid and fluid mechanics; structural, materials, and geotechnical engineering; mechanical and industrial technology and water resources; and urban and environmental technology.

Materials Research—Support is provided for research directed to understanding the properties of solids and cryogenic liquids. Studies in this area encompass research in solid state physics; physical metallurgy; process metallurgy; inorganic, polymer, and physical chemistry; ceramics; and the engineering properties of materials.

Mathematics—Provides research in core mathematics and in the application of mathematics to other sciences.

Physics—Supports research on the most fundamental aspects of the properties and interactions of matter and energy. (Solid state physics is supported as part of the materials research program.)

Social Sciences—Support is provided for research in the social sciences which includes investigations in:

- **Cultural, physical, and social anthropology and archaeology**
- **Economics**
- **Economic and social geography**
- **The history and philosophy of science**
- **Political science**
- **Social psychology, sociology, and social indicators**
- **Linguistics, including computational linguistics**
- **Law-related, social scientific research**
- **Fundamental studies in science policy**

Astronomical, Atmospheric, Earth, and Ocean Sciences—Provides support in the following areas:

- **Astronomy**—Supports ground-based observations and theoretical investigations of extra-terrestrial objects and phenomena.

- **Atmospheric Sciences**—Supports studies in physics, chemistry, energetics, and other fields related to the atmospheres of the Earth and the Sun.

- **Earth Sciences**—Supports studies dealing with the structure, composition, and history of the solid earth.

- **Oceanography**—Supports research in physical, chemical, and biological oceanography, in the geological processes affecting the ocean basins and in physical limnology.

For more detailed information on astronomical, atmospheric, earth, and ocean sciences, see Chapter II.

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Doctoral Dissertation Research

The National Science Foundation awards grants to improve the scientific quality of dissertations in the social sciences, and in certain biological sciences, earth sciences, atmospheric sciences, and oceanography, involving extensive field work. They are intended to make possible the acquisition of data and the means for its analysis that would otherwise not be available. Originality and evidence that a grant will significantly increase the potential scientific contribution of the research will be the principal consideration in making awards.

Grants are awarded for periods up to 24 months. Grant funds may not be used as a stipend for the doctoral candidate, who may, however, receive such support from other sources.

Eligibility

Proposals may be submitted by universities on behalf of doctoral candidates for the support of dissertation research in systematic biology, ecology, and ethology; in the social sciences, including science policy; and in atmospheric sciences, earth sciences, and ocean sciences.

Proposals should be submitted by the dissertation advisor, department chairman, or chairman of the departmental committee on doctoral degrees.

Deadlines

Proposals may be submitted at any time; more than one grant request may be made in a single proposal if the budget for each request is set forth separately. A minimum of 4 months is required for processing an application.

Additional Information

Leaflets that set forth application procedures are available from the Foundation. Communications may be addressed to: Directorate for Biological, Behavioral, and Social Sciences; Division of Atmospheric Sciences; Division of Earth Sciences; or Division of Ocean Sciences.

Engineering Research Initiation Grants

The National Science Foundation awards grants to encourage the development of meritorious and innovative research programs by engineering faculty members.

Two options are available to a prospective grantee:

Option A—provides research support for an investigator for a period of 18 months covering a summer and the following academic year and summer.

Option B—provides support up to 24 months for combining a research program with industrial experience. Under this option, it is expected that the investigator will devote at least one-fourth time during the academic year to research, and will spend 2 months of each summer preceding and following the academic year in a nonacademic environment directly related to the research activities. Additional support is provided to cover the costs associated with relocation during the two summers.

Eligibility

A proposal may be submitted on behalf of an individual who:

(1) Is an assistant professor, instructor or associate professor holding a full-time regular academic appointment on the engineering teaching faculty of an institution of higher education within the United States;

(2) Is a citizen or permanent resident of the United States as of date of submission of proposal;

(3) Has had no substantial research support; and

(4) Was awarded the Ph.D. degree within 2 years of application.

Deadlines

Instructions for preparing engineering research initiation proposals are available in early October from the offices listed below. Request the *Engineering Research Initiation Grants* brochure. Proposals must be postmarked on or before the first Monday in December to be eligible for consideration.

Additional Information

Communications may be addressed to: Division of Engineering or Division of Materials Research, National Science Foundation, Washington, D.C. 20550.

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II. Astronomical, Atmospheric, Earth, and Ocean Sciences

The Astronomical, Atmospheric, Earth, and Ocean Sciences Directorate supports basic research in selected disciplines to increase knowledge of the physical environment, both on Earth and in space. Several elements of the Scientific Research Project Support Activity have been combined with similar programs from the National and Special Research Programs and the National Research Centers to consolidate certain "big" and "little" science programs within scientific disciplines. The objective is to create an effective management structure and to enable equitable allocation of resources and determination of priorities within the various disciplines. The Arctic and Antarctic Research Programs are also part of this directorate.

General objectives of the overall activity are to support basic research leading to:

- New knowledge in astronomy and the atmospheric sciences over the entire spectrum of physical phenomena;
- A better understanding of the physical and chemical characteristics of the Earth and its geologic history;
- Increased insight into the oceans and ocean basins, their composition, structure, behavior, and resources.

Astronomical Sciences

The overall objective of the Astronomical Sciences program is to increase man's knowledge of the universe using telescopes and related instrumentation. Research is aimed at examining the physical principles governing the universe, the structures of the planets and their atmospheres, the solar system, the Milky Way, and remote galaxies.

The National Science Foundation provides support for the development and operation of four National Research Centers in astronomy where radio, optical, infrared, and special telescopes are made available on a competitive basis to the scientific community. Resident staffs at the centers provide technical assistance to visiting scientists, conduct studies of their own, and develop advanced instrumentation. These centers meet national needs for research in specific areas of science requiring facilities, equipment, staffing, and operational support that are beyond the capabilities of private or State institutions and that could not appropriately be provided to a single institution to the exclusion of others. Unlike many federally sponsored research laboratories, the NSF-supported National Research Centers do not perform specific research tasks assigned by or for the direct benefit of the Government. They are maintained for the purpose of making available, to all qualified scientists, the facilities, equipment, skilled personnel support, and other resources required for the performance of independent research of the scientists' own choosing.

Astronomy Project Support

The Astronomy Project Support program provides a broad base of support for fundamental research directed at explaining celestial objects and the cosmos in terms of physical principles. Searches are undertaken for unknown types of objects and for molecules which may be precursors of life forms. The broad variety of celestial objects permits the study of matter under extreme conditions.

Basic research support is provided under the following grant programs: (1) the Solar System program includes studies of planets, comets, asteroids, surface and atmospheric phenomena on the Sun, and the interplanetary medium; (2) the Stars and Stellar Evolution program is directed toward an understanding of the life cycle of a star, from birth to death; (3) the Stellar Systems and Motions program is designed to improve the understanding of aggregates of stars via a study of their dynamics and kinematics; (4) the Galactic and Extragalactic program includes studies of our Milky Way galaxy, as well as other galaxies and extragalactic objects, with detectors sensitive to radiation from all parts of the electromagnetic spectrum; (5) the Astronomical Instrumentation and Development program supports the design and development of state-of-the-art instrumentation to further the process of data collection from ground-based optical and radio observatories.

Deadlines

Proposals may be submitted at any time during the year. Approximately 6 months should be allowed for review and processing of a formal proposal.

National Astronomy and Ionosphere Center

The National Science Foundation supports the National Astronomy and Ionosphere Center (NAIC), a national center devoted to research in radio and radar astronomy and ionospheric physics. The NAIC is operated and managed by Cornell University under contract to the Foundation. The NAIC headquarters is located on the Cornell University campus in Ithaca, N.Y., and the principal observing facilities are located in Puerto Rico, 12 miles south of the city of Arecibo.

The major objective of the center is to make available to the scientific community visitor-oriented research facilities that will contribute

significantly to our understanding of the Earth's upper atmosphere; the Moon, planets, and other celestial radio sources; and the interstellar medium.

The primary instrument at NAIC is a radio/radar telescope that incorporates a 1,000-foot-diameter fixed spherical reflector. Final alignment of the new aluminum panel surface of the reflector is nearing completion. When the design goal for the alignment is reached, the frequency range available for research operations will be 12 times greater than before. The upper frequency limit will have been extended from the previous 611 MHz to 7,200 MHz.

The 450-kilowatt S-band (2,380 MHz) planetary radar transmitter was installed at the 1,000-foot reflector and became operational in the fall of 1974. This project, sponsored by the National Aeronautics and Space Administration, has increased the sensitivity and resolution of the planetary mapping capability by a thousandfold over that available in 1971.

NAIC provides telescope users with a wide range of research and observing instrumentation, including receivers, transmitters, movable line feeds, and digital data acquisition and processing equipment. The center also has a small permanent staff of scientists, engineers, and technicians who are available to assist visiting scientists and observers.

Eligibility

All qualified U.S. scientists and, on occasion, foreign visitors have access to NAIC facilities, instrumentation, and services, on a competitive basis, subject to priorities based upon the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the time available.

Additional Information

Communications should be addressed to: Director, National Astronomy and Ionosphere Center, Cornell University, Ithaca, N.Y. 14850.

Kitt Peak National Observatory

The National Science Foundation supports the Kitt Peak National Observatory (KPNO), which makes available optical telescopes, observing equipment, and research support services to qualified scientists.

The headquarters of KPNO is in Tucson, Ariz.; observing facilities are located at an elevation of 6,800 feet on Kitt Peak, a mountain 56 miles southwest of Tucson. KPNO is supported under the terms of a contract between the Foundation and the Association of Universities for Research in Astronomy, Inc. (AURA). AURA is responsible for the operation and management of KPNO.

KPNO provides the U.S. scientific community with facilities for research in stellar, solar, and planetary astronomy. The facilities consist primarily of ground-based telescopes and the auxiliary equipment necessary to observe astronomical objects in the optical and infrared regions of the electromagnetic spectrum. The observatory is a visitor-oriented facility that assures visiting astronomers of 60 percent of the observing time on the telescopes.

KPNO maintains the world's largest concentration of facilities for stellar, solar, and planetary research. The observatory is the site of the Nation's second largest reflecting telescope, the Mayall 4-meter instrument. The observatory is also the site of the largest solar telescope, the 1.5-meter McMath instrument.

Nine other telescopes atop Kitt Peak include a 2.1-meter general purpose reflector optimized for observing in the infrared, a 1.3-meter cassegrain reflector for photometric and infrared studies, two 92-centimeter reflectors for direct photography and photoelectric photometry, a 92-centimeter coude feed (associated with the 2.1-meter telescope), two 41-centimeter telescopes used primarily for photoelectric photometry, and a 31-centimeter Schmidt. A solar vacuum telescope and magnetograph is used for mapping magnetic fields of the Sun. The 1.5-meter solar telescope is available for solar and planetary observations.

Kitt Peak is also the site of three University of Arizona telescopes, a University of Michigan 1.3-meter telescope, and a radio telescope operated by the National Radio Astronomy Observatory.

KPNO has a staff of resident scientists, engineers, and technicians who are available to assist visiting scientists and observers.

Eligibility

KPNO makes observing time on each instrument available for the use of visiting scientists. All qualified U.S. scientists and, on occasion, foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work, and the available time.

Additional Information

Communications should be addressed to: Director, Kitt Peak National Observatory, P.O. Box 26732, Tucson, Ariz. 85726.

Cerro Tololo Inter-American Observatory

The National Science Foundation supports the Cerro Tololo Inter-American Observatory (CTIO), an astronomical research center whose optical telescopes and related facilities are available to qualified scientists from the United States, Chile, and other nations in North and South America. CTIO is supported under the terms of a contract between the Foundation and the Association of Universities for Research in Astronomy, Inc. (AURA). AURA is responsible for the operation and management of CTIO. Using telescopes made available by the Federal Government and other organizations, CTIO provides astronomers with the opportunity to observe those parts of the Southern Hemisphere skies that are not visible or not adequately observable from the United States.

The observing facilities of CTIO are located on a 7,200-foot mountain in the foothills of the Andes Mountains about 300 miles north of Santiago. The administrative headquarters is in the coastal city of La Serena, about 60 miles away.

The major instruments at CTIO include the newly operational 4-meter telescope, a 1.5-meter, a 1.0-meter on loan from Yale University, a 92-centimeter originally established jointly with the Lowell Observatory, and two 41-centimeter telescopes. All telescopes are equipped with a wide variety of cameras, spectrographs, and photometers.

Cerro Tololo has a small permanent staff of scientists, engineers, and technicians who are available to assist visiting scientists and observers.

Eligibility

Most of the observing time at Cerro Tololo is used by visiting astronomers. Qualified scientists may use the instruments subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the available time.

Additional Information

Communications should be addressed to: Director, Kitt Peak National Observatory, P.O. Box 26732, Tucson, Ariz. 85726.

National Radio Astronomy Observatory

The National Science Foundation supports the National Radio Astronomy Observatory (NRAO), through which Government-owned radio astronomy facilities are made available to qualified scientists. The NRAO staff assists visiting scientists with the large radio antennas, receivers, and other equipment needed to detect, measure, and identify radio waves from outer space.

Headquarters for NRAO is in Charlottesville, Va.; observing facilities are located primarily in Green Bank, W.Va. NRAO is supported under the terms of a contract between the Foundation and Associated Universities, Inc. (AUI), a nonprofit corporation. AUI is responsible for the operation and management of NRAO.

Major research facilities at NRAO include a 140-foot highly precise, fully steerable radio telescope; an interferometer consisting of three fully steerable 85-foot telescopes with a portable 45-foot telescope for remote operation; and a 300-foot radio telescope steerable in declination (latitude) only. A 36-foot radio telescope operating at millimeter wavelengths is located at the Kitt Peak National Observatory near Tucson, Ariz. NRAO has a staff of resident scientists, engineers, and technicians.

NRAO also designs new radio astronomical facilities, including the Very Large Array (VLA) under construction by AUI on the Plains of San Augustin near Socorro, N. Mex. Begun in 1973 and scheduled for completion in 1981, the VLA will utilize a wye-shaped array of 27 radio telescopes to image celestial radio sources and to measure their radio spectra. NRAO will begin research operations with the partially completed array in 1977.

Eligibility

NRAO makes observing time on each instrument available for the use of visiting scientists. All qualified U.S. scientists and, on occasion, foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the time available.

Additional Information

Communications should be addressed to: Director, National Radio Astronomy Observatory, Charlottesville, Va. 22901.

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Atmospheric Sciences

The Atmospheric Sciences program supports research on a wide range of subjects to add new understanding of the behavior of the Earth's atmosphere. Included are studies of the physics, chemistry, and dynamics of the Earth's upper and lower atmosphere; the acquisition of data on physical processes in the troposphere and stratosphere that will aid in understanding the general circulation of the atmosphere and the physical basis of climate; and research on climate processes and variations, as well as research on smaller scale, shorter term phenomena leading to greater knowledge of weather.

The National Science Foundation provides support for the development and operation of the National Center for Atmospheric Research, a National Research Center devoted to large-scale atmospheric research projects conducted in cooperation with universities and other organizations.

The National Science Foundation also provides support for the participation by the U.S. scientific community in international scientific research endeavors: the Global Atmospheric Research Program (GARP) and the International Magnetospheric Study (IMS).

Basic research support is provided under the following grant programs: the Meteorology program includes all aspects of dynamical and physical meteorology, including atmospheric chemistry; the Aeronomy program supports a broad spectrum of laboratory, theoretical, and field studies, involving processes of ionization, recombination, chemical reaction, photoemission, and transport; and the Solar Terrestrial Research program is concerned with studies of the highest extents of the Earth's atmosphere and the near-Earth space environment, including the magnetosphere, interplanetary medium, and solar atmosphere.

Deadlines

Proposals may be submitted at any time during the year. Approximately 6 months should be allowed for review and processing of a formal proposal.

Additional Information

Communications should be addressed to: Division of Atmospheric Sciences, Atmospheric Research Section, National Science Foundation, Washington, D.C. 20550.

Atmospheric Sciences Project Support

The objective of the Atmospheric Sciences Project Support program is to continue to build a base of fundamental knowledge of the atmospheres of the Earth and other planets, as well as of the Sun. Specific objectives include: to develop the scientific basis for understanding climate and weather; to improve the ability to understand the behavior of environmental factors which control air quality in the troposphere and stratosphere; and to improve our knowledge of the Sun and of neighboring planets, especially as they relate to our understanding of the Earth's upper atmosphere.

Climate Dynamics Program

The National Science Foundation, through the Climate Dynamics program, supports research on the development of a basis for predicting climate variations and for assessing the impact of these variations on human affairs. Toward this end, the program supports research that will contribute to knowledge of the natural variability of climate and to understanding the physical processes governing climate. This program is subdivided into four areas: Climate Data Assembly and Analysis, Climate Index Search, Climate Simulation and Prediction, and Climate Modification and Impact Assessment.

Eligibility

Proposals may be submitted by academic institutions, nonacademic and nonprofit research organizations, and profitmaking and private research organizations.

Deadlines

Proposals may be submitted at any time during the year. Approximately 6 months should be allowed for review and processing of a formal proposal.

Additional Information

Communications should be addressed to: Division of Atmospheric Sciences, Climate Dynamics Research Section, National Science Foundation, Washington, D.C. 20550.

Global Atmospheric Research Program

The Global Atmospheric Research Program (GARP) is a long-term commitment by many nations. The GARP objectives are to study the physical processes in the troposphere and stratosphere that are essential for an understanding of (a) the transient behavior of the atmosphere as manifested in the large-scale fluctuations which control changes of the weather; this would lead to increasing the accuracy of forecasting over periods from 1-day to several weeks; and (b) the factors that determine the statistical properties of the general circulation of the atmosphere which would lead to better understanding of the physical basis of climate.

Within the United States, by formal agreement among Federal agencies, the Foundation is the primary agency for the support of non-Federal research in the program, particularly at universities. The Department of Commerce is the primary agency for Federal activities.

The National Science Foundation awards grants to support research projects which contribute to the GARP objectives.

Eligibility

Institutions eligible to submit proposals under GARP are academic institutions and nonacademic, nonprofit research organizations. Occasionally, NSF sponsors supporting efforts by other Government agencies, particularly for field programs.

Deadlines

Proposals may be submitted at any time; approximately 6 months are required for review and processing of a formal proposal.

Additional Information

Communications should be addressed to: Division of Atmospheric Sciences, Climate Dynamics Research Section, National Science Foundation, Washington, D.C. 20550.

International Magnetospheric Study

The National Science Foundation is one of several Federal agencies sponsoring research contributing to the International Magnetospheric Study (IMS) during 1976 through 1979. The IMS is a multinational program to study the region of near-Earth space which is controlled by the extension of the Earth's magnetic field; the study involves coordinated measurements by a number of spacecraft and ground-based techniques.

The NSF is supporting special IMS projects such as new ground arrays of magnetic, optical, and radio instruments, and is also supporting basic research using new and existing instruments, theoretical techniques and data analysis. The NSF funding for the IMS is through the Solar Terrestrial and Aeronomy programs in the Atmospheric Sciences Division; some research is also sponsored by the Office of Polar Programs. The U.S. IMS Coordination Office, which is presently housed in the NSF, can be contacted for general information on national IMS programs.

Eligibility

Academic institutions and nonacademic, nonprofit research organizations may submit proposals for basic research contributing to the IMS.

Deadlines

Proposals may be submitted at any time; approximately 6 months are required for review and processing of a formal proposal.

Additional Information

Communications should be addressed to: Division of Atmospheric Sciences, IMS Coordination Office, National Science Foundation, Washington, D.C. 20550.

National Center for Atmospheric Research

The National Science Foundation supports the National Center for Atmospheric Research (NCAR), which serves as a focal point for research effort in the atmospheric sciences. NCAR offers support services, fellowships, and research facilities to qualified scientists working in the field of atmospheric research.

Headquarters and major laboratories of NCAR are located in Boulder, Colo. Research activities and operations are worldwide. Support of NCAR is provided under the terms of a contract between the Foundation and the University Corporation for Atmospheric Research (UCAR), a nonprofit corporation. UCAR is responsible for the operation and management of NCAR.

Research programs of NCAR include investigation of the Earth's atmosphere, of the physics of the Sun, and of the regions between the Sun and Earth. NCAR facilities in support of NCAR and of visiting scientists include the National Scientific Balloon Facility at Palestine, Tex., a Computing Facility at Boulder, the Research Aviation Facility at Broomfield, Colo., and a Field Observing Facility at Marshall, Colo.

In addition to conducting its own research programs, NCAR participates in a number of atmospheric research efforts conducted by Government agencies, university scientists, and research groups on a national or international scale. Major efforts include development of computer simulation of atmospheric global circulation patterns and convective cloud processes, measurement of chemical constituents of the atmosphere, theoretical studies and observations of solar-terrestrial phenomena, investigation of the atmospheric conditions responsible for the formation of hailstorms, and development of techniques to abate hail formation. More than 600 scientists, engineers, technicians, and support personnel comprise the NCAR staff.

Eligibility

Visiting scientists study and conduct research at NCAR under fellowships and research programs. NCAR facilities are available to qualified scientists, subject to scheduling considerations.

Additional Information

Communications should be addressed to: Director, National Center for Atmospheric Research, P.O. Box 3000, Boulder, Colo. 80303.

Earth Sciences

The Earth Sciences programs are devoted to increasing basic knowledge of the Earth and its ocean floor. Earth Sciences supports programs to obtain basic information about the nature, origin, history, and behavior of rock formations. The results of this research provide better understanding of the forces that affect the Earth's interior and modify its surface, and give us a better comprehension of the processes which have produced petroleum, coal, metals, and other earth resources.

The National Science Foundation sponsors the Ocean Sediment Coring program, an international scientific endeavor directed at understanding the geologic history of the Earth through examination of the ocean floor.

Earth Sciences Project Support

The Earth Sciences Project Support program is concerned primarily with the geological, geophysical, and geochemical constitution of the Earth's crust. The objectives of this program are to provide man with a basic knowledge of the structure and composition of rocks that comprise the Earth's crust, and the processes that form and modify these rocks. In the Geology program, the goal is to increase our understanding of the rocks of the Earth's crust. Field-oriented geological studies range from investigations of rocks nearly 4 billion years old to the processes of modern environments along present-day beaches, rivers, glaciers, and volcanoes. The Geochemistry program has as its goal the understanding of the chemistry of the Earth, the composition, age, and origin of its minerals, and the nature of the chemical processes that are now shaping it and have shaped it in the past. It seeks a better understanding of such topics as the melting of rocks within the Earth, the formation of ore bodies, and the path of possible pollutants through the hydrologic cycle. The objective of the Geophysics program is to support research concerned with the physical properties of the solid Earth. Specific projects involve the study of the Earth's dimensions, its magnetic, electrical, and gravitational fields, and its dynamic processes. The range of research subjects includes seismology, gravity, geodesy, rock magnetism, earth currents, and heat flow. (See also the description under Ocean Sciences support for marine aspects of these research areas.)

Deadlines

Proposals may be submitted at any time during the year; approximately 6 months should be allowed for review and processing of a formal proposal.

Ocean Sediment Coring Program

The National Science Foundation sponsors the acquisition of geologic samples from the floor of the deep ocean basins by means of rotary drilling and coring in the sediments and the underlying crystalline rocks. Portions of the core samples are made available to qualified scientists for individual research projects.

The major activity under the program is known as the Deep Sea Drilling Project, managed by the Scripps Institution of Oceanography of the University of California, San Diego. The drilling and coring operations are performed aboard the ship *Glomar Challenger*. About 60 deep ocean sites are occupied per year, yielding about 20,000 linear feet of 2 1/2-inch-diameter cores. Drill sites have been located in water depths exceeding 20,000 feet, and sub-bottom penetrations of more than 4,200 feet have been achieved. Since August 1968, about 600 holes have been drilled and cored at about 400 sites in the Atlantic, Pacific, Antarctic, and Indian Oceans; the Mediterranean, Caribbean, Bering, Norwegian, and Red Seas; and the Gulf of Mexico.

About 10 to 12 scientists participate aboard the drilling ship on each 2-month cruise, describing the cores lithologically and paleontologically. These descriptions and resulting interpretations, along with those from shore-based laboratories, are published in a series of

volumes—*Initial Reports of the Deep Sea Drilling Project*, one volume for each cruise. The volumes are placed with all major libraries, and are available for purchase by individuals from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Samples of core material for detailed analysis are available to qualified scientists throughout the world a year after the completion of the cruise that collected the cores.

Additional Information

Communications should be addressed to: Division of Earth Sciences, National Science Foundation, Washington, D.C. 20550.

Suggestions for scientific planning, including sites to be included on the drilling itinerary, may be addressed to: Manager, Deep Sea Drilling Project, Scripps Institution of Oceanography, University of California, San Diego, Calif. 92037.

Scientists interested in participating aboard the drilling ship may write to: Chief Scientist, Deep Sea Drilling Project, address as above.

Requests for samples of the core material may be directed to: Curator, Deep Sea Drilling Project, address as above.

Proposals for studies of core materials should be submitted to: Central Processing Section, National Science Foundation, Washington, D.C. 20550.

Ocean Sciences

The overall objective of the Ocean Sciences program is to improve man's understanding of the nature of the ocean and its influence on man's activities and of man's impact on the marine environment. This is accomplished through three major activities: two basic research programs—one for support of individual scientists primarily at the oceanographic institutions, the other for support of a limited number of large managed projects within the International Decade of Ocean Exploration (IDOE), and a program which provides for the acquisition and operating costs of the oceanographic facilities needed to carry out these research programs, Oceanographic Facilities and Support (OFS).

Oceanography Project Support

The Oceanography Project Support program provides a broad base of support for fundamental research in all subfields of marine science, including physical oceanography and limnology, marine chemistry, biological oceanography, and submarine geology and geophysics, with the objective of increasing our store of scientific knowledge and enhancing our understanding of the scientific aspects of major problems in the marine environment confronting the Nation. Most of the research supported is basic in character, although some work of a more applied nature is also supported. Through this program support may also be provided for research workshops, symposia and conferences, and for the purchase of scientific equipment.

Deadlines

Proposals may be submitted at any time; approximately 6 months are required for review and processing of a formal proposal.

Additional Information

Communications should be addressed to: Division of Ocean Sciences, Oceanography Section, National Science Foundation, Washington, D.C. 20550.

International Decade of Ocean Exploration

In support of the International Decade of Ocean Exploration (IDOE), the National Science Foundation awards grants and contracts for cooperative programs of ocean research and exploration with emphasis on environmental quality, environmental forecasting, seabed assessment, and living resources. The program supports a relatively small number of research projects which concentrate on broad scientific problems especially susceptible to concerted effort by the research community. Emphasis is placed upon scientific excellence and applicability of results. The Decade is unique in that it brings major efforts to bear on globally planned and coordinated studies of the ocean as a system.

The long-range goals of the Decade are:

(1) to preserve the ocean environment by accelerating scientific observation of the

natural state of the ocean and its interactions with the continental margins;

(2) to develop and improve an ocean forecasting and monitoring system, to facilitate prediction of oceanographic and atmospheric conditions, and to reduce hazards to life and property and permit more effective use of marine resources;

(3) to expand seabed assessment activities to permit better management of ocean mineral exploration and exploitation.

(4) to improve worldwide oceanographic data exchange; and

(5) to increase opportunities for international sharing of responsibilities and costs for ocean exploration and assure better use of limited exploration resources.

The U.S. national program and other nations' IDOE programs are coordinated closely with the Long-Term and Expanded Program of Oceanic Exploration and Research of the Intergovernmental Oceanographic Commission of UNESCO. IDOE is identified as "the acceleration phase" of this program.

Eligibility

Industry and other organizations are eligible for support on the same basis as educational institutions in the Foundation's International Decade of Ocean Exploration program. Universities will receive support in the areas of research suited to their expertise. Unsolicited research proposals are subject to cost-sharing. Proposals are solicited as necessary in certain areas. Awards resulting from solicited proposals may provide full costs, with cost-sharing or fees negotiated as appropriate.

Guidelines on eligibility, programs, and proposal preparation are contained in the NSF publication *International Decade of Ocean Exploration—A Guide to the Preparation of Proposals*, which may be obtained from the Foundation.

Deadlines

Proposals may be submitted at any time; approximately 6 months are required for review and processing of a formal proposal.

Additional Information

Communications should be addressed to: Division of Ocean Sciences, Office for the International Decade of Ocean Exploration, National Science Foundation, Washington, D.C. 20550.

Oceanographic Facilities and Support

The National Science Foundation awards grants or contracts for support of construction, modification, conversion, purchase, and operation of oceanographic facilities which lend themselves to shared usage. Community arrangements for shared use of these facilities have been developed under the University National Oceanographic Laboratory System (UNOLS).

Facilities supported under this program are those required for research both in the open oceans and in coastal areas. Examples of such facilities are ships, boats, submersibles, aircraft, piers, shipboard and related shore computing capability, and environmental simulation units.

The Foundation encourages local contributions from non-Federal funds whenever possible; however, there is no fixed requirement as to the amount of funds that institutions must contribute.

Before submitting a proposal for support under this program, institutions should seek advice from the Office for Oceanographic Facilities and Support (OFS). A general brochure and specific formats and instructions are available for certain program ac-

tivities, such as ship operations support, shipboard technician support, and support of capital equipment.

Eligibility

The primary objective of OFS is to provide support for large and expensive oceanographic facilities in accordance with the demonstrated needs of NSF-funded research and training programs in the total academic oceanographic community. Access to NSF-funded facilities is assured to qualified users through UNOLS.

OFS support for major oceanographic facilities utilized by the academic community is concentrated at a limited number of institutions which are suitably located and have the logistic capability to carry out major facility operations. These facility-operator institutions have substantial ongoing oceanographic research programs of their own and also provide facilities support for research programs of non-operator institutions. Non-operator academic institutions with substantial oceanographic research programs may apply for direct facilities support if they can demonstrate the capability to conduct such operations to fulfill research requirements not now being met.

Deadlines

Ship operations, shipboard technician, and shipboard equipment proposals are due July 1 each year. Proposals requesting support for other activities may be submitted at any time during the year.

Additional Information

Communications should be addressed to: Division of Ocean Sciences, Office for Oceanographic Facilities and Support, National Science Foundation, Washington, D.C. 20550.

For information concerning UNOLS operations, communications should be addressed to: UNOLS Executive Secretary, Woods Hole Oceanographic Institution, Woods Hole, Mass. 02543.

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Arctic Research Program

This program, administered by the Office of Polar Programs, has four objectives: (1) to increase man's knowledge of the arctic environment and its dynamic parameters and to allow intelligent use of the resources of the region; (2) to improve coordination of the arctic research programs of the Federal agencies; (3) to encourage cooperation in research with other nations having arctic interests; and (4) to develop mechanisms for the exchange of scientific data and research plans, nationally and internationally.

Within the Arctic Research Program are seven areas of concentration: marine research, including the polar pack ice; terrestrial biology, including analysis of the ecosystem; social and economic studies; meteorology; solar terrestrial physics; glaciology, including permafrost; geology and geophysics; and information services.

The Foundation also supports activities in the arctic region through grants and contracts awarded by existing program elements of various offices and divisions.

Coordination of Federal agency research is accomplished through the Interagency Arctic Research Coordinating Committee (IARCC), which is composed of representatives of the agencies sponsoring research in the Arctic or Subarctic and chaired by the National Science Foundation. The Foundation publishes a quarterly *Arctic Bulletin* on behalf of the IARCC to report Federal arctic research activities.

Eligibility

Universities, colleges, and academically related nonprofit research organizations may submit proposals for grants or contracts for research project support. Industry and other organizations are also eligible for support.

Because of far-reaching scientific, logistic, and international implications of arctic research projects, it is essential that scientists specify all field needs and requirements when submitting proposals. Proposers should also consult the Foundation's brochure *Grants For Scientific Research*. Requests for support of field research should be submitted 1 year before the investigators wish to go into the field.

Additional Information

Communications should be addressed to: Office of Polar Programs, National Science Foundation, Washington, D.C. 20550.

U.S. Antarctic Research Program

The National Science Foundation awards grants or contracts for field research in Antarctica and study of resulting specimens or data in the United States.

Administered entirely by the Foundation, the U.S. Antarctic Research Program supports projects in all relevant sciences—human behavior, biology, cartography, geology, glaciology, meteorology, oceanography, solid-earth geophysics, upper atmosphere physics, and magnetospheric physics.

After continuous work since the 1957-58 International Geophysical Year, an initial survey of the continent and its surrounding seas is nearing completion. Now, in addition to work by individual scientists or small groups, large technological projects—usually interdisciplinary and international—are under way to investigate specific processes, many of which have global relevance: drilling into bedrock to retrieve the continent's first deep rock cores, mounting a four-nation project that will lead to understanding of the mass budget of the ice sheet, evaluating the living resources of the southern ocean, measuring worldwide pollution levels, and working toward the ability to predict long-range changes in global climate, and cooperating in the International Magnetospheric Study (see page 13).

Field research can be carried out year-round at U.S. stations in the Antarctic Peninsula, in Ellsworth Land, on Ross Island, and at the geographic South Pole. From early October to late February, frequent air service is provided for scientists between the United States and all stations except the one on the Antarctic Peninsula, which is serviced by the Foundation's 125-foot research ship *Hero* from December to April. In the austral summer, temporary camps can be established to meet specific research requirements. Austral summer research is sometimes carried out aboard icebreakers in the pack ice. Arrangements sometimes are made with other countries for support for research at their antarctic stations. Oceanic research is performed in cooperation with Argentina aboard ARA *Islas Orcadas*.

Stateside support is given as required for science information activities, including the ongoing *Antarctic Bibliography* and sorting centers for geological and biological specimens and for deep-sea sedimentary cores. An index of available topographic maps may be obtained free from the U.S. Geological Survey, 1200 South Eads Street, Arlington, Va. 22202. The Foundation publishes the *Antarctic Journal of the United States* to report field activities, preliminary findings, and trends in the program.

Eligibility

Academic institutions and academically related nonprofit research organizations may submit proposals for grants or contracts for research project support. Industry and other organizations are eligible for support for solicited proposals.

Because of far-reaching scientific, logistic, and international implications of all antarctic research projects, it is essential that scientists specify all field needs and requirements when submitting proposals. Proposers also should consult the Foundation's brochure *Grants for Scientific Research*. Requests for support of field research should be submitted 1 year before the investigators wish to go into the field.

Additional Information

Communications should be addressed to: Office of Polar Programs, National Science Foundation, Washington, D.C. 20550.

III. Research Applications

During recent years the National Science Foundation has developed improved capabilities to stimulate research efforts more immediately and directly related to problems of society.

The Foundation's Research Applied to National Needs (RANN) program focuses U.S. scientific and technological resources on selected problems of national importance for the purpose of contributing to their timely, practical solution. RANN also serves as a bridge between basic research programs and the developmental, demonstration, and operational programs of Federal mission agencies, State and local governments, and industry.

Research Applications deals primarily with problem-oriented research. The specific needs of the Nation and the related challenges and opportunities provide the basis for the program objectives and research supported under these programs. This requires careful and objective analysis by the scientific community and the application and expansion of the pool of directly relevant knowledge to specific problems usually within the selected RANN program areas. Research Applications also places considerable emphasis on the evaluation, dissemination, and utilization of the results of the research supported.

RANN's major areas of emphasis in fiscal year 1976 are in Productivity, Environmental, and Energy and Resources research. Other efforts are conducted under Exploratory Research and Technology Assessment. Before submitting a proposal for research support, descriptive brochures on RANN should be consulted.

The following criteria were utilized in developing the ongoing major coordinated research efforts of RANN:

- **Importance**—the significance and urgency of the problem area or the potential consequences for the Nation are great;
- **Payoff**—the benefits to be realized are significantly higher than the anticipated research and implementation costs;
- **Leverage**—science and technology can have a unique and substantial impact on the problem and be of generalized use to others;
- **Readiness**—the effort is timely, scientifically ready, and the skilled manpower is available;
- **Capability**—Government, academic, and industrial capabilities exist to mount a successful research program;
- **Need for Federal Action**—the research is not being conducted by private industry because the identifiable incentive is not sufficient or the market is fragmented;
- **Appropriateness for RANN**—RANN can most effectively serve the research needs of the Nation when the problem (a) falls between or outside areas of responsibility of other agencies; (b) spans the areas of responsibility of other agencies; or (c) relates to meeting longer range and special requirements.

Eligibility

Research proposals may be submitted by colleges, universities, profit and nonprofit organizations, and by State, local, or regional governments. Industry, State and local governments, and other organizations are eligible to participate on the same basis as academic institutions in research related to national needs, although universities will continue to receive primary support in the areas of research suited to their special expertise. Joint proposals from universities, nonprofit institutions, industry, and/or governments are encouraged to bring broader capabilities as well as interdisciplinary skills to the support of the NSF Research Applications program. In fiscal year 1976, the RANN Program will devote at least 7 1/2 percent of its program budget to small business awards.

Unsolicited proposals are expected to offer a unique technical contribution, show strong relevance to program objectives and, by statute, provide cost-sharing. Proposals are solicited as necessary and awards resulting from solicited proposals may provide full costs, with cost-sharing or fee negotiated as appropriate.

Deadlines

Unsolicited proposals may be submitted at any time and should first be submitted in preliminary form for discussion. Approximately 6 months are required for consideration of formal proposals. Informal inquiry is recommended to determine whether or not a potential project would qualify for support. Program announcements, program solicitations, and requests for proposals will be issued from time to time in targeted areas. Such announcements will specify a deadline for submission.

Additional Information

The publication *Guidelines for Preparation of Unsolicited Proposals to Research Applied to National Needs* describes the guidelines for preparation of proposals to the RANN program. Communications relating to a specific program area may be addressed to the appropriate division or office: Division of Advanced Productivity Research and Technology, Division of Advanced Environmental Research and Technology, Division of Advanced Energy and Resources Research and Technology, Office of Exploratory Research and Systems Analysis, and Division of Intergovernmental Science and Public Technology. General inquiries and requests for publications may be addressed to the Office of Programs and Resources, National Science Foundation, Washington, D.C. 20550 or when west of the Rocky Mountains, to the National Science Foundation, Western Projects Office, 831 Mitten Road, Burlingame, California 94010.

Productivity

The objectives of the RANN program of research on productivity are to improve the performance and output in the public and private sectors and to analyze the effects of public policies on productivity.

Public Sector Productivity

• **Service Delivery and Technology Systems**— Research is supported on equipment technology, management techniques, and policy analyses used by local governments in five priority service areas: solid waste management, urban water resources, fire protection, financial management, and urban recreation.

• **Excavation Technology**—The objectives of this program are to increase excavation rates and to reduce the costs of subsurface excavation and construction. Research supported in this section of the program will include consideration of social, economic, and legal aspects of the technology.

• **Instrumentation Technology**—Research emphasis is placed on the development and testing of noninvasive medical diagnostic techniques. Included in this section are assessments of the effects of these technologies on the productivity of medical and health services.

• **Telecommunications Technology**—This program will continue to support work on the applications of two-way cable communications to public services, undertake new work on the development of teleconferencing systems, and on analyses of issues in the regulation of the communications industry, and expand research on the social effects of broadcast television.

• **Productivity Measurement**—This program has two components: the measurement of the efficiency and effectiveness of public services and administrative services. The public service delivery portion of the program will continue to support the development of productivity measures for urban and social service delivery systems at the State and local levels of government. For certain urban services, where a series of productivity measures is already established, the program will support efforts to determine the validity of these measures and evaluate their cost-effectiveness for use in management and budgeting. The administrative services portion of the program will continue to develop and test productivity measures.

• **Federal/State/Local Relationships**—The purposes of this research are to identify the effects of State and local variations in government structure on the efficiency and effectiveness of service delivery and to analyze the degree to which alternative approaches to Federal assistance produce the intended effects.

• **Regulation and Economic Productivity**—Research will continue on the effects of alternative regulatory policies and processes on productivity and on the effects of tariff and non-tariff trade barriers on productivity.

• **Distribution and Equity**—This program deals with the distributional and equity problems involved in the more productive use of human resources. Included is research on ways to reduce waste and inefficiency through improving the safety and durability of goods and services available in the marketplace and on innovative ways of increasing the productivity of the handicapped by restoring them to active social or economic participation.

Private Sector Productivity

Advanced Industrial Processing

Federal support of research on private sector productivity is needed when private R&D performers cannot capture the benefits of R&D investments because of market conditions and structures; when the benefits of research occur beyond the planning horizons of the private sector; when the risks and uncertainties of the research are high; or when private market resources are inadequate and there will be a significant national benefit from the research.

• **Excavation Technology**—The objectives of this program are to increase excavation rates and to reduce the costs of subsurface excavation and construction.

• **Instrumentation Technology**—Research emphasis is placed on the development and testing of noninvasive medical diagnostic techniques.

• **Industry System Research**—Research in this area will deal with productivity issues within a particular industry. Projects will concentrate in a systematic examination of each process step taken within or through a given industry and identify critical points which present opportunities for increased productivity. Validation research with industry will be supported to test findings.

• **Production Research and Technology**—The objective of this research is to develop and examine the new technological options for U.S. manufacturing and to assess their cost-effectiveness. Research focuses on the application of programmable automation to the discrete product industries, for example, durable goods. "Programmable automation" refers to using general-purpose machines and special computer programs to enhance productivity in industries, such as machine tools, which produce limited quantities of different kinds of goods.

Regional Productivity Research

This research will address those opportunities for improvement in industrial productivity which are a function of the regional character of many industries by capitalizing on the proximity of industry to academic and other research centers. Industry/university teams will be funded to undertake research on technical problems related to productivity within their region.

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Environment

The goal of the RANN Environment program is to enhance the Nation's capability to mitigate environmental hazards, whether natural or man-caused. Objectives of the program are to:

- Identify and analyze the nature and extent of man-caused and natural environmental hazards;
- Identify and evaluate innovative methods for preventing the event or mitigating the effects of environmental risks;
- Evaluate social and technological opportunities for, and constraints to, the adoption of innovative mitigation procedures;
- Synthesize acceptable environmental risk management strategies.

Managing the Natural Environment

Regional Environmental Management

The purpose of this program is to study regional environments and resources in order to establish the scientific basis for their management and use. At this stage of the Nation's commitment to improving the quality of the environment, research is needed to examine comprehensively the consequences of the many environmental programs being implemented by Federal, State, and local agencies. A major aim of the program is the enhancement of man's capacity to select from the universe of development and management strategies those which most effectively achieve environmental quality objectives within the context of other societal goals. Objectives of the program are to:

- Provide an improved economic and ecological basis for environmental decisionmaking;
- Investigate methods for predicting land use and other secondary consequences of environmental control;
- Synthesize and test regional environmental management strategies; and
- Examine the applicability of selected technologies to regional environmental management problems.

Chemical Threats to Man and the Environment

This program focuses on identifying, understanding, and ameliorating contamination problems arising from the mining and processing of metal ores, manufacturing and use and disposal of chemical products. Specific objectives are:

- Identify and quantify the contaminants resulting from the manufacture, consumption, and disposal of organic and inorganic chemicals;
- Assess the potential for damage to ecosystem communities, populations, and biological species along contaminant flow paths;
- Improve existing techniques in analytical chemistry specifically applicable to achieving the above objectives.

Disaster and Natural Hazard Research

RANN research on disasters and natural hazards includes three program subelements: Weather Modification, Earthquake Engineering, and Socioeconomic Response to Natural Hazards. The natural hazards to be considered are primarily dynamic in nature and include earthquakes and tsunami.

Earthquake Engineering

The research thrust of this program is to develop methods which will allow decisionmakers to limit damage should an earthquake occur. The elimination of all loss of life and property damage from earthquakes would be prohibitively expensive. The need is to assess the likelihood of such losses and to weigh these

against the increased costs of planning and designing structures to avoid them. The basic objectives of the program are to:

- Develop economically feasible design and construction methods for building earthquake-resistant structures;
- Develop procedures for integrating information on seismic risk with the ongoing land use planning process;
- Present information in forms usable by affected communities in seeking to reduce their vulnerability to earthquakes.

Weather Modification

The objective of this program is to develop and test selected weather modification technologies and evaluate the impact of those technologies upon society. The program will continue to emphasize research on weather hazard mitigation, weather modification technology, inadvertent effects of weather modification, and social and economic effects. The specific objectives may be defined as follows:

- Develop a level of understanding of the mechanisms of hail formation in severe convective storms which will lead to a more reliable method of hail suppression;
- Develop a more adequate knowledge of the ice nucleation mechanism in the atmosphere which will result in a capability to measure and predict the consequences of a seeding operation;
- Develop sufficient understanding of the mechanisms by which human habitation may produce anomalies in the weather patterns so that adverse effects may be forecast in advance and corrective action taken to minimize the impact;
- Develop new and more accurate concepts of how, when, and under what circumstances weather can be modified by artificial means; and
- Increase our understanding of the social, economic, legal, and ecological impact of operational weather modification practices upon society.

Socioeconomic Response to Natural Hazards

The purpose of this research is to evaluate the benefits and costs of different combinations of adjustments that can be applied to specific natural hazards. Studies will assess the effectiveness and comparative value of prediction and warning, disaster preparedness, physical protection, land use management, insurance, and relief. The objectives of this program are to:

- Evaluate the costs and benefits of alternative policies for dealing with natural hazards; and
- Increase the analytical base for dealing with low probability, very high risk events.

Resources

The Resources Program supports research to identify and evaluate long-term technological options for meeting national resource needs and provide scientific and technological bases for analysis and formulation of national and regional resource policies. Specific areas of emphasis include:

- **Resource Systems**—Support for comprehensive analysis of the availability and utilization of alternative resources, giving consideration to economic, social, legal, technical and environmental factors.

- **Renewable resources**—Support for research on selected agricultural, forest and food product problems. Examples include converting woodwaste materials to industrial chemicals, developing substitutes for energy intensive products, such as nitrogen fertilizers, and creating technology for producing protein from nontraditional sources.

- **Nonrenewable Resources**—Support for research on selected mineral resource problems, including economic analysis, options for efficient use of resources and technological options for mineral processing.

Exploratory Research and Technology Assessment

The program supports systematic studies of the effects of technology on society, including systems analyses associated with alternative policies or technologies which could be introduced to help alleviate major national problems.

Exploratory Research

Exploratory research is geared to determine major current and future national problems which are not adequately covered by public or private research activity. The purpose is to generate initiatives for the major programs of RANN (Environment, Productivity, Energy and Resources) as well as to determine areas for future RANN support. Each RANN program is responsible for exploratory ideas in its particular area.

Technology Assessment and Policy Impact Studies

Technology assessments and policy impact studies are crucial to informed decision-making concerning the introduction of new technologies and policies. Major problems exist in the economy and society to which there are various technological and policy options. Technology assessment is the systematic study of the effects on society that may occur when a technology is introduced, extended, or modified, with special emphasis on the impacts that are unintended, indirect, or delayed. Research which rigorously examines not only the first order impacts of these solutions but also higher order and unforeseen effects is supported by this program.

The problems on which such studies are focused cover technological, economic, and social issues of major national consequence. The technologies suitable for consideration can range across the spectrum from hardware, to biological, and managerial technologies. The policies can range across various social and economic policies relevant to national needs.

Intergovernmental Science

The National Science Foundation awards grants to enable State and local levels of government to develop new and improved policies, procedures, and mechanisms for increasing the systematic application of research and technology to governmental processes and problems and to promote Federal-State-local research and technology interrelationships.

The objective of the Intergovernmental Science Program (ISP) is to ensure that science and technology are integrated into the policy planning, program planning, and program execution activities in State and local government.

The proposed activity must involve a problem or issue of general interest to State or local governments and must have broad application at those levels of government. In capacity building projects, preference will be given to institutional innovations that enlarge the alternative approaches available to State and local governments to promote research and technology applications in the public sector. Activities supported may include the development of structures, mechanisms, policies, procedures, programs, or public personnel systems—all designed to improve the policy processes, administrative management, or program operations at those levels of government through research and technology. Planning grants, pilot projects, prototype projects, and replication and diffusion projects are available for these purposes.

Analytical studies are supported that improve understanding of the processes of capacity building and institutional change in State and local government; that define the issues and challenges presented in attempting to increase the application of research and technology at those levels of government; and that assess alternative, inplace approaches to institutionalizing such processes and activities. Eligible activities also include conferences, workshops, seminars, and other similar mechanisms designed to advance the understanding of issues at the State and local levels having scientific and technological content and to promote the dissemination of information and case examples related to public sector research and technology applications.

Eligibility

Proposals may be submitted by units of general-purpose local governments; units of State government, including both the executive and legislative branches; the State, regional, or national instrumentalities of State and local governments and their officials; multi-State and sub-State regional entities; colleges, universities, professional schools, or other institutions for education, training, and research; nonprofit research and technology institutions; professional societies; in-house laboratories of Federal agencies and federally funded research centers; and vendors of research and technology services. Proposals may combine a unit of government with an institution from the research resource community. There is no requirement for matching funds but normally applicants are required to share the cost of any proposed activity. Collaborative arrangements with other programs within NSF and with other Federal agencies are permitted; proposals may be submitted to such agencies for partial support and to ISP for those activities that fall outside the program scope of such agencies, but within that of ISP.

Research and Development Incentives

The National Science Foundation supports a program designed to provide experimental evidence concerning various incentives which the Federal Government might use to increase the application and use of science and technology in the private sector. The objective of the program is to test and evaluate selected incentives which the Federal Government may properly and effectively use to increase R&D investment in the private sector where new technology is in the national interest.

The program provides a focus in the Federal structure for testing various means of accelerating the rate of technological innovation and increasing R&D investment in the private sector of the economy. The program supports:

- Background studies for identifying problem areas and incentive opportunities;
- Experiment definition studies that lay out in detail the design of an experiment to test a given incentive in a given case;
- Experiment evaluation studies undertaken by independent investigators in those cases where judgmental evaluation is required.

Areas of current interest include:

- Background studies addressing the use of financial and/or regulatory incentives for accelerating the rate of adoption for selected technologies.
- Experiments wherein proposals are solicited that reflect familiarity with, and the thrust of, work previously undertaken, specifically with the following experiments:

— **Federal Laboratory Validation.** Proposals are solicited for testing innovations having high potential for adoption by cities in the Urban Technology System;

— **Cooperative Research.** This experiment tests limited Federal cost-sharing as an incentive for "seeding" long-term, self-sustaining university-industry cooperative research efforts. Projects are conducted on a two-phase basis: Phase I consists of the experiment definition (partnership arrangements and technology emphasis) and design of an operational plan; Phase II consists of actual performance of the cooperative research activities. Additional performers will be added under both phases during the next few years;

— **Innovation Centers.** This experiment tests the suitability of Federal Government involvement in assisting potential entrepeneurs and innovators in achieving their career objectives, by subsidizing university-based innovation centers for a specific period of time. During fiscal year 1976-77 it is planned to add one or more university centers, and emphasis will be placed on centers that focus on idea generation, development, and evaluation—in preparation for licensing or new venture formation; and

- Evaluation-Interpretation of Ongoing Experiments. Because it is anticipated that interpretation of RDI experiments will need to be supplemented by alternate, innovative methods for treating data beyond the standard analytical techniques, proposals are solicited for exploring the appropriateness of using such supplemental methods in RDI's evaluation program.

Eligibility

Proposals may be submitted by units of State and local governments and their State, regional, or national organizations; legislatures; colleges and universities; professional schools; industrial organizations; State academies of science; nonprofit in-

stitutions; public service institutions; research institutions; and trade organizations. Proposals may provide for collaborative arrangements. Such arrangements are not mandatory. Proposals combining academic institutions and units of government will be of particular interest. There is no requirement for matching of funds, but normally applicants are required to share in the cost of any proposed activity. Contractual arrangements are made on occasion with profit-makers for the performance of work in which they are uniquely qualified.

Proposals may be submitted to other Federal agencies for partial support and to NSF for those activities that fall outside the program scope of other Federal agencies.

IV. Science and Technology Policy Research and Analysis

The Directorate for Scientific, Technological and International Affairs is the focal point within the Foundation for the analysis of important scientific and technological issues and the development of policy options for addressing these issues.

The legislative charter of the Foundation authorizes and directs it to (1) evaluate the status and needs of the various sciences as evidenced by the programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups; and (2) provide a central clearinghouse for the collection, interpretation, and analysis of data on the availability of and the current and projected need for scientific and technical resources in the United States, and to provide a source of information for policy formulation by other agencies of the Federal Government.

The policy research and analysis programs within the Directorate for Scientific, Technological, and International Affairs conduct and sponsor studies and analyses which cover a broad range of issues. Normally, research activities are not supported except where such research is necessary to a more comprehensive understanding of the policy or analysis issue which is the primary subject of interest.

Science and Technology Policy

The Division of Policy Research and Analysis (PRA) has been assigned the central staff support role within the Directorate for Scientific, Technological, and International Affairs for:

- Providing advice, consultation, and recommendations on national civilian science and technology policy matters.
- Developing policy options related to the solution of national problems in the civilian area.
- Appraising the overall effectiveness of ongoing Federal and national R&D efforts and recommending policy and program actions toward the achievement of national goals through civilian science and technology.
- Interacting with academic and industrial communities on broad matters of science and technology policy so as to further their participation in strengthening U.S. science and technology.
- Providing advice, assistance, and coordination in furthering U.S. international science and technology objectives.
- Developing an understanding of the relationships between science and technology and national social and economic objectives.

The fiscal year 1976 program of outside grant and contract activity reflects the needs for detailed studies and analyses to support the development of policy options and program initiatives, and consists of the six elements discussed below.

The Effects of Public Policy on Science and Technology

Public policies directed to social and economic goals significantly influence the science and technology environment. For this reason PRA attention is directed towards an understanding of the:

- Incentives available to the government for stimulating socially desirable technological innovation by the private sector.
- Disincentives to technological innovation created by policies directed to other public concerns.

The Analysis of Emerging Science and Technology

The continued advance of S&T, apparently at an increasing rate, raises a variety of important and interrelated issues:

- the adequacy of existing national and international policy instruments and monitoring and control mechanisms for dealing with the potential impacts of emerging S&T;
- the adequacy of federally-supported basic and applied science to meet national (as against strictly agency) needs, in the aggregate and in specific sectors;
- the adequacy of the S&T base for Federal regulatory activity, in such areas as health and safety, the environment, water supply and waste management;
- "spin off impacts" of Federal S&T programs, such as: space science, weather modification, earthquake prediction;
- the adequacy of Federal mechanisms for monitoring international sources of discovery, invention, and innovation and the potential impacts of foreign government policies and programs on the health of the U.S. S&T enterprise.

Socioeconomic Effects of Science and Technology

This area covers the broad range of effects of S&T. It seeks to improve the conceptual framework and techniques available to identify and measure the socioeconomic variables

and relationships needed to assess policy issues and options. Specific areas considered as priority candidates for investigation include:

- Distribution of public vs. private costs and returns from innovation.
- Benefits and dislocations created by changing technology.
- Domestic effects of international technology transfer.
- Effects of S&T on the individual.
- Effects of S&T on productivity.
- Application of social science research to S&T policy formulation.

The Analysis of International S&T Policy

The PRA interest extends to such matters as:

- the impact on broad U.S. interests of the increasingly wide employment of the promise of preferred access to U.S. S&T as an instrument of foreign policy;
- the impact of international cooperative S&T programs on the U.S. scientific community and its institutions;
- the impacts of international S&T transfer, through Government and private channels, on the foreign partners—unrealizable expectations, brain drains, distorted social priorities, etc., as well as improved means of production, quality of life, etc.;
- appropriate institutional arrangements for U.S. involvement in international cooperative S&T activities, bilateral and multilateral;
- the purpose and value of U.S. support of and participation in the S&T programs of international organizations;

The Processes of Innovation and Their Management

This study area is concerned with the processes by which technological innovation occurs. Further insight is needed in the following areas:

- Innovation processes in the private manufacturing sector.
- Innovation processes in State and local government.
- Innovation processes in services, both public and private.
- The role of the individual in innovation.
- The role of investment capital in innovation processes.

Policy Aspects of Energy, Resources, and Environment

Responsibilities of this activity are associated with assembling and analyzing a wide range of information on energy and resource related issues including those of:

- Energy technology research.
- Environmental and health issues related to energy.
- The relation of science and technology to renewable and nonrenewable resources.

Eligibility

The work of this program is performed by a group of analysts within the Directorate for Scientific, Technological, and International Affairs and through grants and contracts with universities and other appropriate organizations.

Study proposals which are supportive of the program activities are considered for awards. The program of studies is a cooperative effort involving the analytical staff at the Foundation and a limited number of extramural grants and contracts.

Profitmaking and other organizations are eligible to participate in the Division of Policy Research and Analysis Programs on the same basis as academic and nonprofit organizations.

Deadlines

Proposals may be submitted at any time during the year. Approximately 3 to 6 months should be allowed for review and decision.

Additional Information

Further information on the specific interests of the six major program areas may be obtained from those individual programs. Communications should be addressed to the Division of Policy Research and Analysis (indicate specific program of interest), National Science Foundation, Washington, D.C. 20550.

Science Resources Studies

The program of the Division of Science Resources Studies encompasses information on:

- The funding of scientific and technological activities;
- The development and utilization of scientific and technical manpower, including academic training;
- The institutional framework of science and technology;
- The interrelationships between science, technology, and other elements of the national economy.

The overall objective of the program is the development of factual and analytical information to provide a basis for national science policy formulation in the area of science and technology. In order to carry out its mission, the Division of Science Resources Studies engages in and supports two types of closely interrelated activities.

The first involves collection of statistical data. These data are of prime importance because analyses of policy and subsequent policy formulation cannot be carried out effectively without this factual information. This activity includes:

- Development of the conceptual basis for data collection, including derivation of useful and meaningful taxonomies and definitions;
- Information collection through various means;
- Integration of data and other information from various sources.

The second activity involves the analysis of resource information, including studies of the factors that affect and limit the supply and utilization of science resources. These studies encompass:

- Science resource issues raised nationally and within the Federal Government;
- Identification of issues arising out of data;
- Development of projections and projection methodologies;
- Development of models which can be used for analyses of the science resources system.

Eligibility

The greater part of the work of the program is performed internally or through contractual agreements with other Federal agencies and other appropriate non-Federal organizations. Special studies are frequently supported through grants and contracts. Thus, unsolicited proposals, which are supportive of the program activities, are welcomed and are considered for awards.

Deadlines

Proposals may be submitted at any time during the year.

Additional Information

A detailed description of the program and copies of reports and publications are available. Communications should be addressed to: Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550.

V. International Scientific and Technological Opportunities

The Foundation encourages and supports U.S. scientific participation in international science programs and activities that promise maximum benefit to the U.S. science effort.

It is Foundation policy to foster the interchange of information among scientists in the United States and foreign countries, initiate and support scientific activities in connection with matters relating to international cooperation, support basic research abroad (in special cases) as a supplement to the national research effort, and provide support to U.S. institutions for research which is to be conducted abroad.

Programs described in this chapter are administered by the Division of International Programs (DIP) and complement other Foundation activities in support of scientific research and science education. DIP welcomes inquiries about any of the programs listed and encourages U.S. scientists and engineers to discuss with this office plans and new approaches to international cooperation in science.

DIP is a component of the Directorate for Scientific, Technological, and International Affairs.

United States-Australia Cooperative Science Program

The National Science Foundation awards grants to support the participation of U.S. scientists in the United States-Australia Cooperative Science Program. Australian funds support Australian scientists participating in the program.

Three types of projects are supported:

- Scientific seminars or workshops
- Long- and short-term visiting scientists
- Cooperative research.

Brochures describing the program and proposal guidelines are available from the Foundation.

Eligibility

Those eligible to submit proposals are academic institutions, professional societies, other private and public scientific organizations, and individual scientists. Governmental scientific organizations may also participate but generally have to provide their own funding. An informal inquiry to the Foundation is recommended prior to the submission of a formal proposal. All projects must be approved by the Foundation and the Department of Science in Australia.

Deadlines

Proposals for seminars between the 12-month period from July 1 through June 30 must be received by the preceding January 1. For long-term visits with starting dates between April 1 and September 30, the receipt date is the preceding September 1; for those between October 1 and March 31, the receipt date is the preceding February 1. Proposals for short-term visits and for cooperative research should be submitted at least 6 months before the desired starting date.

Additional Information

Communications may be addressed to: United States-Australia Cooperative Science Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-Republic of China Cooperative Science Program

The National Science Foundation awards grants to support the participation of U.S. scientists in the United States-Republic of China Cooperative Science Program. Chinese funds support Chinese scientists participating in the program.

Three types of projects are supported in the program:

- Cooperative research projects
- Visiting scientists
- Scientific seminars

A brochure describing the program is available from the Foundation, together with guidelines for submitting proposals.

Eligibility

Those eligible to submit proposals are colleges and universities, nonprofit research institutions, professional societies, and individual scientists. The program is aimed primarily at the academic scientist; however, others may be considered. All projects must be approved by the Foundation and the National Science Council in Taipei.

Deadlines

Proposals may be submitted at any time; approximately 6 months are needed for consideration.

Additional Information

Communications may be addressed to: United States-Republic of China Cooperative Science Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

East Europe Cooperative Science Programs: Romania, Hungary, Czechoslovakia, Bulgaria

These programs are offered to foster and support scientific and technological cooperation on a bilateral basis between the United States and each of the cooperating countries. The programs are conducted and coordinated between the National Science Foundation and comparable organizations in the cooperating countries.

Under these programs, research-oriented cooperative activities may be conducted and supported in any branch of science and technology, including basic and applied aspects of the natural sciences and mathematics, the engineering sciences, and the social sciences, and including interdisciplinary or problem-oriented areas. Support is offered for three types of activities:

(1) Cooperative research—projects designed jointly by, and to be conducted collaboratively between, a principal investigator of the United States and a principal investigator of the cooperating foreign country. Proposals are submitted by an American institution to the National Science Foundation and by the institution of a foreign investigator to the coordinating agency in his country.

(2) Seminars—meetings of small groups of scientists of the United States and of the foreign country, jointly designed and convened by American and foreign co-organizers. A seminar may be held in the United States or in the cooperating foreign country. Proposals are submitted by the American co-organizer or his institution to the National Science Foundation and by the foreign co-organizer through his institution to the coordinating agency in his country.

(3) Scientific visits—visits of short duration for the purpose of planning cooperative scientific activities or conferring about cooperative scientific activities; also, with Romania, visits of longer duration for purposes of research, study, or lecturing. The application of an American scientist to visit one or more of the cooperating countries is submitted by him to the National Science Foundation; the application of a foreign scientist to visit the United States is submitted by him or by his institution to the coordinating agency in his own country.

Eligibility

American institutions eligible to participate in these programs include universities and colleges, professional societies, academies of sciences, and other nonprofit scientific organizations of the private or public sectors. Support is available for American scientists who are U.S. citizens or who have at least 5 years of professional employment beyond the doctorate in U.S. institutions and are currently affiliated with an eligible U.S. institution. American scientists employed by profit-making organizations are not eligible for support.

Additional Information

The brochure *Cooperative Science Programs: Romania, Hungary, Czechoslovakia, Bulgaria; Cooperative Research, Joint Seminars, Scientific Visits* is available from the Foundation.

Communications may be addressed to: East Europe Cooperative Science Programs, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-France Exchange of Scientists Program

The National Science Foundation (NSF) and the Centre National de la Recherche Scientifique (CNRS) jointly sponsor an exchange of scientists for postdoctoral study or research in the mathematical, physical, chemical, engineering, biological, and social sciences, including economics. Awards are not made in the medical sciences, education, or business fields. A small number of cooperative research proposals and applications for senior visiting scientist awards are also considered each year by NSF and CNRS.

Eligibility

Individuals eligible for the postdoctoral exchange program are citizens or nationals of the United States and France who have earned a doctoral degree or its equivalent not more than 5 years prior to the commencement of the exchange visit. Eligible institutions are, for American candidates, any appropriate nonprofit French institution. Appropriate nonprofit institutions are institutions of higher education; government research institutes, laboratories, or centers; and privately sponsored nonprofit institutes. The period of the exchange visit is between 5 and 15 months. French candidates may obtain information and application materials from the CNRS. American candidates may obtain information and application materials from the address below.

Additional Information

Communications may be addressed to: United States-France Exchange of Scientists Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-India Exchange of Scientists Program

The National Science Foundation administers the participation of U.S. scientists and engineers in a program of short-term exchanges with India for the purpose of exchanging scientific information and planning future scientific cooperation. In India the program is administered by the Council of Scientific and Industrial Research (CSIR). These organizations are jointly responsible for approving each exchange visit. The National Science Foundation pays only travel costs of U.S. scientists to and from India. Within India, expenses are covered by the local hosts. A brochure describing this program is available from the Foundation.

U.S. institutions that wish to invite specific Indian scientists for visits under the provisions of this program may suggest their names to NSF, in addition to encouraging them to make direct applications to CSIR.

Eligibility

Individual senior scientists and engineers are eligible to submit proposals. Requests are evaluated on the basis of the applicant's professional qualifications and the merit of the proposed activity in India.

Deadlines

Proposals may be submitted at any time.

Additional Information

Communications should be addressed to: United States-India Exchange of Scientists Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-Israel Binational Science Foundation

The United States-Israel Binational Science Foundation (BSF) came into existence under an agreement between the two Governments, signed on September 27, 1972. It establishes a program of cooperative scientific research and related activities to be conducted principally in Israel, to be financed with Israeli currency, and involving scientists and institutions of the United States and Israel. Activities must be of mutual interest to the United States and Israel and concerned with science and technology for peaceful purposes. Activities dealing with scientific and technological information are also considered.

The BSF is operated with the interest from a fund contributed to equally by both countries. The U.S. contribution represents U.S.-owned Israeli currency, chiefly resulting from payments by the Government of Israel for surplus agricultural commodities sold under Public Law 83-480.

The interests and activities of the scientific agencies of the U.S. Government in BSF are coordinated through the Department of State. U.S. institutions may submit proposals on BSF forms in either of the following ways:

(1) Directed to a scientific agency of the U.S. Government having a mission related to the subject of the proposal. The agency forwards it to BSF with comments concerning the relevance of the proposal to the mission of the agency; judgments as to its scientific merit are the responsibility of BSF. NSF encourages the submission of proposals of high quality which complement or otherwise relate to research supported under NSF programs.

Such proposals may be addressed to:

Division of International Programs
(U.S.-Israel Binational Science Foundation)
National Science Foundation
Washington, D.C. 20550

Phone: (202) 632-5796

(2) Directed to the following address:

U.S.-Israel Binational Science Foundation
P.O. Box 7677
Jerusalem, Israel

Proposals submitted directly to BSF will later be referred by it to the U.S. Government for comment.

Deadlines

Although proposals may be submitted at any time, decisions on awards are made in February of each year. To allow sufficient time for evaluation, proposals should be submitted in time to reach BSF no later than July 1 of the preceding year.

Additional Information

Inquiries about the preparation of proposals of interest to the National Science Foundation may be addressed to NSF at the address shown above. Single copies of the BSF form "Application for Research Grant" may be obtained from the same address.

The program described above is a program of the United States-Israel Binational Science Foundation and should not be confused with National Science Foundation programs. Consequently, institutions and investigators should be aware that standard NSF proposal and award guidelines and procedures are not applicable.

United States-Italy Cooperative Science Program

The National Science Foundation coordinates the participation of U.S. scientists and institutions in the United States-Italy Cooperative Science Program.

The objectives of the program are to promote cooperation between scientists of the two countries for peaceful purposes and to provide additional opportunities for them to exchange ideas, skills, and techniques; to attack problems of particular mutual interest; to work together in unique environments; and to utilize special facilities.

Types of projects included in this program are:

(1) Joint research projects.

(2) Exchange of scientists, in connection with approved projects.

(3) Seminars to exchange information and plan cooperative research.

Each activity in the program involves participation by scientists of both countries and requires approval by the Foundation and by the Consiglio Nazionale delle Ricerche, the executive agencies responsible for carrying out the terms of the agreement in the United States and Italy. Nothing in the agreement is intended to prejudice other arrangements for scientific cooperation between the two countries.

Funds for the support of the activities of American scientists may come from any U.S. source, which includes but is not confined to the regular research support programs of the Foundation. In addition, limited OIP program funds are available for the support of visiting scientists, the organization of binational seminars, and for developmental cooperative research grants. Proposals are submitted to the appropriate funding agency or institution in accordance with its normal procedures. At the same time, the U.S. investigator sends a copy of his proposal to the address below, together with a copy of the joint application form, signed by him and the Italian principal investigator. A brochure describing the United States-Italy Cooperative Science Program is available from the Foundation, together with instructions and guidelines for submitting proposals.

Additional Information

Communications should be addressed to: United States-Italy Cooperative Science Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-Japan Cooperative Science Program

The National Science Foundation awards grants to support the participation of U.S. scientists in the United States-Japan Cooperative Science Program. Japanese funds support Japanese scientists participating in the program.

Three types of projects are included in the program:

- Cooperative research.
- Scientific seminars.
- Visiting scientists.

A brochure describing the program is available from the Foundation, together with guidelines for submitting proposals.

Eligibility

Those eligible to submit proposals are colleges and universities, nonprofit research institutions, professional societies and individual scientists. The program is aimed primarily at the academic scientist; however, others may be considered. All projects must be approved by the Foundation and the Japan Society for the Promotion of Science.

Deadlines

Proposals for cooperative research may be submitted at any time; approximately 6 months are needed to consider a proposal. Proposals for seminars between October 1 and March 31 must be received by the preceding February 28; for seminars between April 1 and September 30, the receipt date is the preceding August 31. Proposals for visits to Japan beginning April 1 and September 30 must be received by the preceding August 31; for those beginning between October 1 and March 31, the deadline date is the preceding February 28.

Additional Information

Communications should be addressed to: United States-Japan Cooperative Science Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-Latin America Cooperative Science Programs

These programs are offered to foster and support scientific cooperation on a bilateral basis between the United States and several Latin American countries. The National Science Foundation coordinates the particpaton of U.S. scientists in these programs under Agreements of Scientific and Technical Cooperation with the appropriate counterpart agencies in the countries involved. Formal agreements for which the National Science Foundation is responsible have been signed with Argentina, Brazil, and Mexico. Other countries in Latin America may also be considered.

Under these programs, research-oriented cooperative activities may be conducted and supported in any branch of science, unless specifically limited by mutual agreement between the coordinating agencies. Support is offered for three types of activities:

Cooperative research—projects designed jointly and conducted collaboratively by principal investigators from the United States and from the cooperating foreign country. Proposals are submitted by the U.S. institution to the National Science Foundation and by the institution of the foreign investigator to the coordinating agency in his country.

Seminars—meetings of small groups of scientists from the United States and from the foreign country, jointly designed and convened by U.S. and foreign co-organizers. A seminar may be held in the United States or in the cooperating foreign country. Proposals are submitted by the U.S. co-organizer or his institution to the National Science Foundation and by the foreign co-organizer through his institution to the coordinating agency in his country.

Scientific visits—visits of short duration for the purpose of planning cooperative scientific activities or conferring about cooperative scientific activities; also, visits of longer duration for purposes of research. The application of a U.S. scientist to visit one or more of the cooperating countries is submitted by him to the National Science Foundation; the application of a foreign scientist to visit the United States is submitted by him or by his institution to the coordinating agency in his own country.

Eligibility

U.S. institutions eligible to participate in these programs include universities and colleges, professional societies, academies of sciences, and other nonprofit scientific organizations of the private or public sectors. Support is available only for U.S. scientists who are citizens of the United States or who have at least 5 years of professional employment beyond the doctorate in U.S. institutions and are currently affiliated with an eligible U.S. institution. U.S. scientists employed by profit-making organizations are not eligible for support.

Deadlines

Proposals for cooperative research and seminars should be submitted either by October 15 or March 31. Proposals for scientific visits can be submitted at any time. Processing time for proposals averages 6 months.

Additional Information

Communications should be addressed to: United States-Latin America Cooperative Science Programs, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-New Zealand Agreement for Scientific and Technological Cooperation

The National Science Foundation can consider proposals from U.S. scientists for cooperative activities with New Zealand scientists in areas other than energy (energy-related activities are coordinated by the Energy Research and Development Administration's Office of International Programs).

Requests which may be considered by NSF are primarily for supplemental support for visits by U.S. scientists to New Zealand to participate in collaborative research or bilateral meetings. An informal inquiry to the Foundation is recommended prior to the submission of a formal proposal.

Eligibility

Those eligible to submit proposals are colleges and universities, nonprofit institutions, professional societies, and individual scientists. Governmental scientific organizations may also participate but generally have to provide their own funds.

Additional Information

Communications may be addressed to: United States-New Zealand Agreement for Scientific and Technical Cooperation, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

United States-Spain Cooperative Science Program

The National Science Foundation, through a special program funded by the Department of State, provides U.S. support to Spanish projects in science and technology under the terms of the 1970 Agreement between the Governments of the United States and Spain.

The program's objectives are to strengthen Spanish science and technology by making available U.S. scientific and technological resources, both human and material.

Project proposals, which must originate in Spain, are presented by the Government of Spain to the Government of the United States annually, through diplomatic channels, and are then reviewed by the National Science Foundation with the Directorate General for International Technical Cooperation of the Spanish Ministry of Foreign Affairs for feasibility.

Types of projects included in the program are:

- Joint seminars, held in the United States or Spain
- Cooperative research between U.S. and Spanish scientists
- Study travel and training of Spanish scientists in the United States.

Eligibility

The Agreement calls for cooperation in all fields of science, engineering, and technology; urban and environmental studies; and agriculture.

U.S. scientists are welcome to participate in seminars and cooperative research projects supported by the program and are encouraged to correspond directly with Spanish scientists and make their interest known. Only projects which are officially approved by the Government of Spain and forwarded through the U.S. Embassy in Madrid can be considered for support.

Additional Information

Communications should be addressed to: United States-Spain Cooperative Science Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

International Science Studies Program

The principal goal of the International Science Studies Program is to develop a body of critical information about the mechanisms, problems and benefits of international science activities. Through this program, a limited number of studies concerned with research, science education, science administration, and science organization in various regions and countries will be supported. It is anticipated that these studies will contribute to the intellectual and scholarly resources in the field of international science.

Eligibility

Proposals may be submitted by colleges, universities, and nonprofit institutions. Normally, applicants are required to share the cost of any proposed activity. Contractual arrangements may be made with profitmaking organizations for the performance of work for which they are uniquely qualified.

Additional Information

Communications should be addressed to: International Science Studies Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

Scientists and Engineers in Economic Development Program

The National Science Foundation, through a special program funded by the Agency for International Development (AID), will provide support for individual U.S. scientists and engineers to apply their experience to problems of development in 41 countries currently receiving assistance from AID.

The program's objectives are to enable U.S. scientists and engineers to share experiences with their counterparts in developing countries who formulate and conduct specific research and education programs contributing in a direct way to economic development in their countries; establish long-term collaborative relationships between U.S. and foreign institutions; and increase the capability of scientific and technical institutions in developing countries.

Types of projects included in this program are:

(1) Research/Teaching Grants—An individual may apply through his institution for support to enable him to conduct research or teach for 5 to 12 months in an academic institution of a developing country. Grants may provide stipend plus air travel allowance for scientists and dependents. Local costs in the foreign country must be met by the host institution.

(2) International Travel Grants—An individual may apply for an International Travel Grant to engage in research or teaching in institutions of developing countries for a period less than 5 months. Grants will provide the cost of economy class air travel plus a small amount of incidental expenses. Per diem and local costs must be provided by the host institution.

Eligibility

Applicants are limited to scientists and engineers from U.S. academic institutions with at least 5 years of postdoctoral or equivalent experience in teaching or research and who will return to their institutions on completion of the project.

Proposals will be considered in the following fields: engineering, physical sciences, earth sciences, biological sciences, social sciences, and science education.

Evidence of the host institution's support for the proposed project must be shown.

Additional Information

Communications should be addressed to: Scientists and Engineers in Economic Development Program, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

Special Foreign Currency Programs

The National Science Foundation makes awards to support scientific activities overseas which will incur costs payable in the currencies of Burma, Egypt, Guinea, India, Pakistan, Poland, and Tunisia. These awards are in two categories: grants for research, science education, and related activities; and contracts for procurement of scientific and technological information. They utilize foreign currencies which the Treasury Department has determined to be in excess of the established requirements of the United States.

Research, Science Education, and Related Activities—Three main classes of activity are included in this program: cooperative research and science education projects, international travel, and visiting scientist activities. A principal purpose of the program is to obtain for scientists and institutions of the United States the benefits of cooperation with their counterparts in participating countries.

The Foundation brochure *NSF Special Foreign Currency Program, Support for Research Science Education, and Related Activities, Information for U.S. Scientists* describes the classes of activity supported and provides other information. A companion publication, subtitled *Information for Scientists in Participating Countries*, is also available. The program provides necessary *supplemental* dollar support to U.S. institutions for activities which directly enhance the benefits of U.S. participation; requests for *principal* dollar support by U.S. institutions may be included in proposals for consideration by other program offices of NSF.

Foreign Science Information—In fulfilling its responsibility for coordinating the needs of U.S. Government agencies, the Foundation contracts with organizations in participating countries for delivery of scientific and technological information to the United States. Contracts cover translating, abstracting, indexing, reviewing, and publishing in English of significant foreign scientific literature. The preparation and publication of surveys, directories, guides, and other reference aids on foreign scientific and technical information resources—literature, institutions, scientists—is also undertaken under contract.

The following sections on eligibility and deadlines refer only to **Research, Science Education, and Related Activities.**

Eligibility

Organizations eligible to submit project proposals are nonprofit higher educational institutions, scientific institutes, scientific and technical societies, and similar organizations, chartered to conduct business in the United States or the participating country. Scientists affiliated with such organizations may apply for support for international travel or visiting scientists activities.

Agreement on the objectives, content, and scope of a cooperative project should be reached by U.S. and foreign scientists before they submit proposals. Consultation or correspondence with the Division of International Programs by prospective U.S. or foreign proposers prior to submission of a formal proposal is recommended. Formal proposals should be prepared in accordance with the requirements outlined in the relevant NSF brochures. Project proposals to be funded in foreign currency must be approved by the government of the participating country; the scientific institution in that country which is co-sponsor of the project initiates the request for approval.

Deadlines

Proposals for activities to be funded by foreign currency may be submitted at any time. Approximately 6 months are required to consider a project or visiting scientist proposal; 5 months are required to consider a proposal for an international travel grant.

Proposals for the support of costs of organizing a conference or symposium should

be submitted 8 to 12 months in advance to allow time for the organizer to inform key participants concerning the NSF decision.

Additional Information

Communications should be addressed to: Special Foreign Currency Section, Division of International Programs, National Science Foundation, Washington, D.C. 20550.

Requests for information about the availability of materials produced under the Foreign Science Information Program should be addressed to National Technical Information Service, U.S. Department of Commerce, Springfield, Va. 22151.

These programs are managed by the Directorate for Scientific, Technological, and International Affairs.

VI. Science Education

The major objectives of the NSF Science Education Program are to:

- Help assure the Nation of an appropriate variety, quality, and number of scientific and technological personnel with greater participation of minorities and women.
- Strengthen the performance of institutions delivering science education to a broad range of students in order that a substantially increased number of people can make effective use of the processes and results of science in their work and personal lives whether or not they are engaged in scientific or technical occupations.
- Identify and develop cost-effectiveness and efficiency of science education by means of programs involving modern instructional technology, strategies, and methodologies.
- Increase the public understanding of science and technology and their role in meeting national needs.

Program activities are structured around four major themes:

- Science Manpower Improvement
- Science Education Resources Improvement
- Science Education Development and Research
- Science and Society

The following summary provides a brief description of the Science Education program elements. The descriptions are not intended to be guides for the preparation of proposals; such guides should be requested separately and are referenced in each description. Prospective proposers should consult the specific program guide for preparation of proposals regarding details of objectives, eligibility, and ad-

ministration. In requesting guidelines, send a separate postcard for each publication desired and identify by brochure number and title. Requests should be addressed to:

Central Processing Section
Attention: Publications Unit
National Science Foundation
Washington, D.C. 20550

Other inquiries related to the respective program should be sent to the staff unit referenced in each program description.

Science Manpower Improvement

The Science Manpower Improvement Activity provides support for programs designed to assure that the Nation's most talented graduate students in the sciences obtain the education necessary to become a cadre of first-line researchers needed by our technologically based society; to train the manpower specifically needed to help meet the Nation's energy problems; to expose a small number of the most scientifically talented high school and college students to research activities; and to stimulate the participation of more women in science careers.

Components of the Science Manpower Improvement Activity are:

Graduate Fellowships

It is expected that in fiscal year 1976 the nationally competitive Graduate Fellowship Program will provide approximately 500 new 3-year fellowships to be awarded to beginning graduate students.

The competition is open only to citizens or nationals of the United States.

For the program announcement (E-76-12) write to:

Fellowship Office
National Research Council
2101 Constitution Ave., N.W.
Washington, D.C. 20118

The deadline for this program was December 1, 1975.

Postdoctoral Energy-Related Fellowships

Approximately 90 fellowships for tenures of 6 to 12 months are planned for award in fiscal year 1976 to recent postdoctorals who have demonstrated a special aptitude for research and who have an interest in energy-related problems. The competition is open only to citizens or nationals of the United States. For the program announcement (E-76-37) write to the National Research Council at the address given above. The deadline for receipt of applications in this program was December 8, 1975.

Energy-Related Graduate Traineeship Program

Energy-Related Graduate Traineeships are offered to help meet the Nation's emerging needs for scientific and professional manpower especially trained in energy-related work. In 1976, approximately 90 new traineeships will be awarded for graduate study of energy in the areas of coal research and research on the recovery and/or substitution of nonrenewable resources.

Doctoral-granting institutions may obtain information concerning the program by writing for brochure number E-76-20; the deadline for receipt of institutional proposals was November 7, 1975. An announcement of institutions receiving awards will be available from the Foundation after March 24, 1976. Individuals should apply only after this date, directly to the awardee institutions and not the National Science Foundation.

NATO Fellowships in Science

At the request of the Department of State, the Foundation administers two fellowship programs for the North Atlantic Treaty Organization (NATO).

NATO Postdoctoral Fellowships. Awards are made to U.S. citizens for full-time postdoctoral-level study in science in countries that are members of NATO (other than the United States) or in other countries which cooperate with NATO. Approximately 50 awards will be made in fiscal year 1976 to outstanding individuals who have recently received (or will soon receive) doctoral degrees in science. Evaluation of applicants is based on their academic records, letters of

recommendation, and ability to carry out the activities proposed in the applications. This program is designed primarily for applicants who have received their doctorates within the past 5 years. For the program announcement, request brochure E-76-13.

NATO Senior Fellowships in Science. These awards are made to senior U.S. scientists for short visits abroad to study new scientific techniques and developments in countries that are members of NATO (other than the United States) or in other countries which cooperate with NATO. Tenures range from 30 to 90 days, and awards carry travel and per diem allowances. An application must be accompanied by a statement from an appropriate official of the applicant's home institution describing the expected benefits to the institution if the fellowship were awarded. For the program announcement, request brochure E-76-14.

Travel Grants for NATO Institutes

The Foundation awards travel grants to enable young U.S. scientists to attend certain NATO Advanced Study Institutes. These meetings, held usually during the summer and varying in length from 1 to 8 weeks, permit exhaustive treatment of a given scientific topic. Grants normally cover the cost of the round-trip air fare involved. The directors of the institutes are invited to nominate U.S. citizens for these awards from among those admitted to their institutes, and these individuals are then invited to apply to the Foundation for grants. Therefore, individuals should make their interest in a NATO Travel Grant known to the directors of the institutes they wish to attend. Lists of institutes receiving such support are available from the Foundation annually around March.

Additional Information

Communications should be addressed to:

Fellowships and Traineeships Programs
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Student-Oriented Programs

Student-Oriented Programs have three closely related goals: (1) to provide talented students with science learning opportunities above and beyond those normally available in most formal science education programs in the Nation's schools and colleges; (2) to increase the variety of instructional modes and of institutional patterns of instruction by demonstrating to both students and faculties the capacity of students to be motivated by independence and thus to accept greater responsibility for planning and carrying out their own learning activities; and (3) to identify and encourage science and engineering talent.

Through each of three separately described programs—Student Science Training for High Ability Secondary School Students, Undergraduate Research Participation, and Student-Originated Studies—support is provided for projects that encourage students to develop their ability to operate more independently in their studies in science and assume greater responsibility for their own learning, and that enable them to utilize the great motivational potential inherent in independent study. Successful projects are marked by improvement in students' perspective of science and by teachers' conversion of conventional classroom-laboratory instruction to a more independent type of project work.

The Foundation invites submission of proposals for support of three types of activity directed toward achieving the goals stated above.

Secondary School Students Science Training

Secondary School Students Science Training (SST) projects support summer science programs, established by academic institutions and nonprofit institutions with appropriate scientific and educational expertise at the college or university level, aimed at testing the aptitude of outstanding secondary school students for science by bringing them into direct contact with educational ex-

periences in science and mathematics beyond those available in the usual high school courses.

Deadlines

Proposal deadline was October 10, 1975. Request brochure E-76-43, *Student Science Training Program*, for further information about this program.

Undergraduate Research Participation

The Undergraduate Research Participation Program (URP) allows undergraduates who have completed a substantial portion of their requirements in science to work full time during the summer directly with faculty members on research projects. In addition, a limited number of projects arranged for and managed by science faculty members will place undergraduates in an industrial laboratory where the students will be under the direct mentorship of an industrial scientist.

Proposals may be submitted in any science discipline, but within those disciplines or specialties in which energy-related research is feasible, highest priority will be given to projects that fall within the Foundation's definition of "energy-related general research." The fields of science identified as energy-related are listed in the URP program announcement.

Deadlines

Proposal deadline was September 10, 1975. Request brochure E-76-41, *Undergraduate Research Participation Program*, for further information about this program.

Student-Originated Studies

The general aim of Student-Originated Studies (SOS) is to provide students with experience in independent, self-directed study, and to demonstrate the effectiveness of such study as an adjunct to or replacement for portions of their traditional formal course work.

Each study or set of studies is conducted by a group of students comprised of undergraduates, or of an appropriate combination of undergraduate and graduate students. Each project proposed is problem-oriented—to deal with a local problem that has immediate relevance to the community. The projects are wholly student-originated and student-managed, with faculty in an advisory role. There is a general requirement that studies be conducted by multidisciplinary groups and be concerned with problems of the physical, biological or social environment.

Deadlines

Proposal deadline was November 10, 1975. Request brochure E-76-42, *Student-Originated Studies*, for further information about this program.

Additional Information

Communications should be addressed to:

Student-Oriented Programs
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Women in Science

For multiple and complex reasons, only a small number of women pursue careers in science. The ultimate objective of this activity is to provide the educational community with a set of proven, cost-effective mechanisms for increasing the number of women in science and to provide NSF with guidance for effective future program efforts. The immediate objectives are (1) to identify and obtain a better understanding of the barriers to careers in science for this group; and (2) to test techniques and educational formats that appear to offer ways to overcome the barriers. Grants are made to academic institutions or education or research organizations for studies directed

toward the first objective and for experiments directed toward the second.

Information regarding the kinds of studies and experiments to receive priority consideration in fiscal year 1976, suggestions for the development of proposals, and information about deadlines may be obtained by writing to:

Women in Science
Directorate for Science Education
National Science Foundation
Washington, D.C. 20550

For general information about how to submit proposals, request brochure E-76-49 *Women in Science*.

Science Education Resources Improvement

In an effort to improve the capabilities of schools, colleges, and universities for education and research training in the sciences the following programs are available.

Comprehensive Assistance to Undergraduate Science Education

The program of Comprehensive Assistance to Undergraduate Science Education (CAUSE), initiated in fiscal year 1976, is designed to encourage improvement in the quality and effectiveness of undergraduate science education in the Nation's colleges and universities.

The program's primary objectives are, specifically to:

- strengthen the undergraduate science education components of 2- and 4-year colleges and universities;
- improve the quality of science instruction at the undergraduate level; and
- enhance institutional capability for self-assessment and continuing updating of their science programs.

To achieve these objectives, the Foundation provides funding for a period of up to 3 years in response to meritorious plans prepared by institutions, subunits of institutions such as departments or divisions, and associations of institutions. Each plan submitted is judged within the context of the institution's carefully prepared statement of its own goals and objectives; each plan submitted is expected to outline a comprehensive, clearly focused set of activities with well-defined goals attainable within the period of the grant, but so structured that beneficial effects can be expected to persist, or be maintained, beyond the grant period.

Deadlines

Deadlines are announced in the brochure covering guidelines for submission of proposals; request brochure number E-76-47.

Additional Information

Communications should be addressed to:

Comprehensive Assistance to
Undergraduate Science Education
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Undergraduate Instructional Scientific Equipment

The Undergraduate Instructional Scientific Equipment Program (ISEP) assists in improving undergraduate science education by providing partial support for the acquisition of scientific equipment required in implementing an improved or new undergraduate instructional program in one or more of the sciences. Universities, colleges and 2-year colleges in the United States or its territories that are introducing improved courses of instruction in the sciences at the undergraduate level are eligible for support by this program. Grants are made on a matching fund basis in which the grantee provides at least 50 percent of the cost of the equipment.

Deadlines

Request brochure number E-76-15 for guidelines for submission of proposals for *Undergraduate Instructional Scientific Equipment*. Deadline for receipt of proposals under this program was January 19, 1976.

Minority Institutions Science Improvement

The Minority Institutions Science Improvement Program (MISIP) provides support for self-determined improvement projects in 2- and 4-year colleges whose enrollment is predominantly composed of Black, Native-American, Spanish-Speaking and/or other ethnic minorities which have been and are disadvantaged. The support is provided to effect long-range improvement in the basic scientific strength of these institutions to assist them in removing or overcoming restrictive practices and impediments to the involvement of their minority students in scientific activities and in improving instructional procedures to prepare their students for careers in instruction, research, communication, or application of science. To qualify for Foundation support, a project will be expected to map out an acceleration of this development that can be maintained after grant termination. Facilities, equipment, methods of instruction, and curricula are some elements of focus which may be supported under this program.

In cases where two or more institutions define a common problem and find it advantageous to attempt a cooperative solution, MISIP will entertain proposals prepared jointly. Activities that lend themselves easily to cooperative efforts are curricular development, course content improvement, teaching materials, and other development.

Deadlines

Proposals may be submitted at any time. Request brochure E-75-8, *Minority Institutions Science Improvement*, for guidelines for submission of proposals.

Additional Information

Communications should be addressed to:

Minority Institutions Science
Improvement Program
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Educational Program Restructuring

The primary purpose of Educational Program Restructuring is to encourage colleges and universities and their faculties in the development and testing of new and unconventional approaches to all aspects of science instruction at the undergraduate level, and to thereby increase nationally the diversity of institutional settings for science. The Foundation seeks proposals with the potential for serving as models of beneficial change in the undergraduate science learning experiences of students who are majors in science, who are enrolled in science courses intended for nonscience majors, or who are preparing specifically for careers as teachers of science in the Nation's elementary and secondary schools.

Support will be provided for explorations involving significant changes in institutional organization for science instruction, and in the management, delivery and/or content of student instructional experiences in science. Emphasis will be placed on projects whose results can be evaluated and documented.

Program areas of focus for the near future are as follows:

Restructuring the Undergraduate Learning Environment (RULE)

RULE Comprehensive Projects: This program component is of special interest to colleges or clearly defined segments of larger institutions, or formally constituted consortia of either, whose faculty and administrative officers are planning major, comprehensive change in their total undergraduate science instructional program. Where appropriate, proposals may be considered jointly with the National Endowment for the Humanities.

RULE Faculty-Oriented Projects: This program component is of interest to individual science faculty or small groups of them who plan to explore focused changes in the content or styles of their science instruction in relatively short-term concentrated efforts. Only projects requesting very modest Foundation funds will be considered.

Pre-Service Teacher Education Program (PSTEP)

Proposals of two types will be considered—those which describe the development of new or unconventional undergraduate programs for the preparation of science teachers for the Nation's schools, and those planning the testing of current recognized models (regardless of the latter's source of developmental support).

Deadlines

Proposals of the Faculty-Oriented RULE type will be considered in groups twice yearly, following closing dates of November 30 and May 30. Other types of restructuring proposals may be submitted at any time, but it is suggested that their submission be preceded by discussions with the program staff. Guidelines for proposal preparation and submission are contained in E-76-10, *Educational Program Restructuring*.

Additional Information

Communications should be addressed to:

Educational Program Restructuring
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Faculty Research Participation

The Faculty Research Participation Program provides opportunities for college and university teachers to participate for 10 weeks during the summer in the ongoing activities of nonacademic laboratories engaged in research on problems of national interest and concern. The purpose of the Faculty Research Participation Program is to encourage and assist teachers in reevaluating the relevance of science instruction to the needs and requirements of students being prepared for applying their education in the national society. Proposals are invited from the research facilities offering the research opportunities; supported projects are announced to interested academic faculty in an annual *Directory of Faculty Research Participation*.

Deadlines

Request brochure number E-76-17 for guidelines for the submission of proposals for *Faculty Research Participation*. The deadline for receipt of proposals under this program was October 1, 1975. Request brochure number E-76-23, *Directory of Faculty Research Participation*, for announcement of research opportunities available in the summer of 1976.

Additional Information

Communications may be addressed to:

Faculty Research Participation Program
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Faculty Fellowships in Science Applied to Societal Problems

Approximately 80 fellowships for tenures of 3 to 9 months are planned for award in fiscal year 1976 to help faculty members in junior and community colleges, colleges, and universities broaden their perspectives in the applications of science to the problems of our society. The competition is open only to citizens or nationals of the United States who are at the time of application a member of the science teaching faculty of a U.S. institution of higher education.

Deadlines

Request brochure E-76-37 for general information about the Faculty Fellowships Program. The deadline for filing an application is February 6, 1976.

Additional Information

Prospective applicants should note that to be eligible for consideration an *application*

must be completed and submitted on the standard forms provided by the Foundation. Application materials and other information may be obtained by writing to:

Faculty Fellowships in Science
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Research Initiation and Support

As part of its effort to assist U.S. colleges and universities in strengthening research and training programs, the Research Initiation and Support Program (RIAS) provides grants to improve the effectiveness, efficiency, and quality of programs of training and research for young scientists at the graduate and postgraduate level. Institutions eligible to participate are those which currently have graduate-level research and training programs in science and engineering. RIAS grants provide support for elements such as exploratory research for young investigators, for the acquisition of instruments, equipment, and facilities associated with an institution's overall plan for upgrading such research and training programs, and for other approaches aimed at meeting institutionally identified needs for training of young scientists. Proposals may address departmental, interdepartmental, or institution-wide training and research needs which are part of a coherent improvement thrust. RIAS grants are not intended to encourage expansion nor to replace established support but to effect an increment of qualitative improvement or a measure of increased efficiency which can be expected to be sustained beyond the period of the grant.

Deadlines

Request brochure number E-76-48 for guidelines for submission of proposals for *Research Initiation and Support*. The deadline for receipt of proposals under this program is March 1, 1976.

Additional Information

Communications should be addressed to:

Research Initiation and Support
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Science Education Development and Research

Science Education Development and Research seeks solutions to problems in science education resulting from economic stringencies, new roles, and functions for science in society and different employment patterns. To meet the needs of the present day educational system, innovations in educational materials and practices are essential to improved productivity. Elements of the program activity established to stimulate and foster needs assessment, development, testing and evaluation are described in more detail below.

Technological Innovation in Education

The objective of this activity is to improve effectiveness and efficiency in science education. The major approach concentrates upon the development and instructional application of technological devices such as computers and television. Support is provided for the development of innovative computer and related communication technologies and systems designed to improve the quality and efficiency of instruction at all levels of education. Support is provided for the exploration, development, and evaluation of:

- computer and related communication technologies and techniques;
- computer-based concepts, applications, and courseware (instructional material); and
- prototype computer-based systems for effective and efficient instruction.

Technology and Systems. Support may be provided for (1) studies of computer technology and techniques applicable to instruction; and (2) projects focused on the testing and evaluation of systems of exceptional technological innovation and promise.

Applications and Courseware. Support may be provided for the development, testing and evaluation of (1) innovative applications and courseware in selected disciplines to stimulate new uses of computing and communications technology for instruction; (2) new instructional concepts related to computer-based education; and (3) mechanisms to facilitate the widespread use of these products and concepts.

Deadlines

Proposals may be submitted at any time. Because extensive planning is usually involved in project development of these types, interested persons should discuss their ideas with program staff before submitting proposals. For guidelines for submission of proposals request brochure E-76-9, *Technological Innovation in Education.*

Additional Information

Communications may be addressed to:

Technological Innovation in Education
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Alternatives in Higher Education

In order to encourage and facilitate change in higher education to meet changing requirements for academic training, this program will support the creation and testing of alternative undergraduate and graduate programs in science and technology that will provide the professional skills needed in today's society, and will assist in the development of new modes of delivering education and the exploration of economical alternatives for introducing new program options into the existing system of higher education.

Alternative Degree Programs

Support will be provided to colleges and universities for design and implementation of curriculum prototypes that, as alternatives to typical basic science research-oriented baccalaureate, master's or Ph.D. degrees, lead to a

wider variety of career options in areas of recognized national need. Institutions may propose entirely new undergraduate or graduate degrees or the restructuring of existing degree programs. In either case a significant element of experimentation must be present, resulting in a meaningful departure from traditional degree programs.

Development of Instructional Materials and Modes

One of the major avenues for the improvement of higher education in science in the past has been the development of curricular materials for use in a traditional lecture-recitation-laboratory format. NSF priorities are now shifting toward newly emerging, problem-relevant subject areas, and toward the search for more effective and efficient modes of delivery. Thus, the focus of this element of AHE will be on the creation of modules, courses, curricula, or instructional sequences in newly significant science or engineering-based problem areas, and on studies of novel delivery systems for both on-campus and off-campus instruction.

There is considerable flexibility in project format or topic, including experimentation with alternative instructional modes, with new materials aimed at development of problem-solving competencies, with applications of modularization and self-pacing, and with independent study. Only those projects that demonstrate the likelihood of use on a national scale will be supported. Preliminary proposals are required.

Deadlines

Proposals may be submitted at any time. Request brochure number E-76-5 for guidelines for the submission of proposals for Alternative Degree Programs and Development of Instructional Materials and Modes.

Science and Engineering Technician Education Program

The primary objective of this program is the development, demonstration, and evaluation of a limited number of new or alternative collegiate-level programs that provide for the education of technical personnel to support scientific and engineering activities. Prototype programs should provide technical personnel with a sound scientific and technical basis for continuing professional growth throughout life, an ability to adapt to future technological advances, and job entry skills for productive employment in scientific and engineering activities. Priority will be given to projects which emphasize the basic core of scientific and mathematical principles underlying technical applications and various combinations of carefully selected specialized subject areas which are responsive to recognized national manpower requirements for technical support personnel. To minimize duplication of effort, existing or pending basic science core materials will be modified and used whenever available. All programs and materials will be developed in flexible formats that assure ease of adoption by the various institutions engaged in technical education and will incorporate, whenever possible, actual or simulated practice of the technical specialty.

Deadlines

Proposals may be submitted at any time. Request brochure E-76-18, *Science and Engineering Technician Education Program.*

Additional Information

Communications can be addressed to:

Alternatives in Higher Education
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Continuing Education for Nonacademic Scientists and Engineers

The objective of this program is to find effective ways to deliver continuing education to professional nonacademic scientists and engineers. As new scientific and technical knowledge accumulates at an increasing rate, scientists and engineers must work harder to maintain mastery over the theories and techniques relevant to their specialties. The cost of technical obsolescence to employees,

employers, and the Nation is so large that efforts must be made to conceive and test economically viable delivery systems that provide practicing professional scientists and engineers with the information they need to function competently.

Support is available for the design and trial implementation of a small number of innovative systems that give promise of increasing the availability, utility, effectiveness, and efficiency of continuing education for scientists and engineers. To achieve support, programs must include novel features not yet tested and must lend themselves to emulation as soon as the instructional mechanisms under test prove their effectiveness. Preliminary proposals are required.

Deadlines

Proposals may be submitted at any time. Request brochure number E-76-5, *Alternatives in Higher Education*, for guidelines for the submission of proposals.

Additional Information

Communications may be addressed to:

Continuing Education for Nonacademic Scientists and Engineers
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Special Studies and Experimentation (Special Projects)

The National Science Foundation recognizes that from time to time there are developed promising, unusual ideas in science education that fall outside the normal scope of the several existing science education programs or combine several features of them.

Three types of requests can be considered:

- proposals for problem assessment or other studies designed to obtain the knowledge and understanding needed before an attack on a specific problem can even be contemplated;
- proposals for experimental projects designed to test proposed solution to problems in science education;
- proposals for conferences provided that they are designed to elucidate or attack specific topics in science education and will lead to specific outcomes or actions.

Expression of interest in the above areas for studies and experimental projects and requests for general information about how to submit proposals should be directed to the address below.

Special Projects in Science Education
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

This program seeks to increase citizen knowledge of the role of science and technology in society today and to identify and analyze the ethical and human value aspects of new developments in science and technology at the earliest possible time. The program elements designed to address these issues are described below.

Public Understanding of Science

The National Science Foundation considers one of its important responsibilities to be the development of a greater public understanding of science. In addition to fostering public understanding of science as part of many grant programs, the Foundation has a special program of Public Understanding of Science seeking to bring direct focus and support to this area. Central to the purpose of this program is the enhancement of citizen knowledge and understanding of both the potentials and limitations in the use of science and technology in meeting current and emerging societal problems.

Proposals are encouraged which relate to one of the following programs, within terms of a single or combined focus.

Information Projects on Science—Proposals to be considered under this general support area should facilitate the dissemination of information science for the general public. Examples of the types of projects which may be eligible for support are: special-purpose films and television programs, science exhibits, traveling demonstration programs, science forums for laymen, and comparable activities.

National, Regional, and Community Programs—Proposals may be submitted for programs in public understanding of science designed to serve either broad or specific audiences of a national, regional, community, or other discrete geographical area. Such programs will normally be multi-purpose in nature and encompass diverse means of communication. Interinstitutional arrangements are particularly encouraged on a matching funds basis.

Research and Methodological Studies—Proposals may be submitted for research or analytical studies of the communications process as it relates to public understanding of science. This category may also include the testing and evaluation of new approaches in communicating scientific information to non-scientists.

Eligibility

Institutions eligible to submit proposals are colleges, universities, and independent, profit and nonprofit organizations.

Deadlines

Proposals may be submitted at any time. Project proposals should initially be submitted informally for preliminary review. Processing of formal proposals normally requires at least 3 months.

Additional Information

The Public Understanding of Science brochure describes the process of submitting proposals in more detail. Communications may be addressed to:

Public Understanding of Science
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

Ethical and Human Value Implications of Science and Technology

The Ethical and Human Value Implications of Science and Technology (EHVIST) Program was established in 1974 to support research, education, and public understanding projects covering the three general areas specified below:

- the impact of new developments in science and technology on the values of society, including ethical dilemmas generated by the scientific and technological enterprise.

- the impact of societal values on the development of science and technology, including ethical and value issues in the setting of national and international research priorities.

- the value issues which arise within science and technology, including ethical problems encountered by scientists and engineers in their professional capacities.

In addition to continuing its unilateral support of projects in this area, the National Science Foundation is prepared to support worthy and appropriate scholarly activities in this field in collaboration with the National Endowment for the Humanities (NEH).

The NSF and NEH have established procedures which will enable them to work in close collaboration in this program. Proposals for research or other activities in this field may be submitted either to the NSF or NEH, depending on their primary orientation. If the subject of inquiry falls within the physical or social sciences or some branch of technology, or if the approach to be used is primarily scientific, the proposal would be more appropriate for NSF. If the subject of inquiry is primarily humanistic or if the approach is primarily philosophical or historical, the proposal would be more appropriate for NEH. To some extent, the disciplines of the investigators and the relative presence or absence of quantitative factors may also serve as a guide. Through coordination between the two foundations, proposals may be transferred from one to the other as indicated by the subject matter, availability of funds, etc. In appropriate instances, there may be joint funding of approved proposals.

Deadlines

Deadlines for formal proposals are specified in the EHVIST Program Announcement, NSF 75-19. Although formal proposals can be submitted directly, it is strongly recommended that preliminary proposals be submitted for staff comment prior to formal submission.

Additional Information

Proposers should consult the EHVIST Program Announcement (NSF 75-19).

Communications should be addressed to:

Ethical and Human Value
Implications of Science and
Technology
Science Education Directorate
National Science Foundation
Washington, D.C. 20550

VII. General Programs

Science Information Service

The National Science Foundation's Division of Science Information (DSI) awards grants and contracts to improve the process of scientific and technical communication. DSI supports research and development projects designed to improve scientific and technological information services. Its functions are limited to support of research, development, demonstration, coordination, and policy development projects.

Support may be provided from the Division of Science Information for the following:

- Studies that provide guidance for improved management of scientific and technical information services within the public and private sectors, including studies of the economics of information transfer.
- Improvements which facilitate cost-effective science information networks capable of providing access to worldwide research results.
- Experiments on ways to promote the use of scientific and technical information.
- Research on information sciences, including both theory and applied aspects.

The Foundation's brochures *Guidelines for Preparation of Unsolicited Proposals for the Economics of Information Program, Guidelines for Preparation of Unsolicited Proposals for the User Support Program, Guidelines for Preparation of Unsolicited Proposals for the Access Improvement Program,* and *Grants for Scientific Research* should be consulted for more specific information about the Foundation's science information programs and instructions for submitting proposals.

Eligibility

Institutions eligible to submit proposals are professional scientific and technical societies, universities and colleges, and profit and nonprofit organizations. Organizations that plan to submit proposals are encouraged to discuss their ideas informally with the appropriate staff members before preparing formal proposals.

Deadlines

Proposals may be submitted at any time; approximately 5 months are required to consider a proposal. In addition, from time to time Program Solicitations are issued for research on selected problems.

PLEASE NOTE: The Division of Science Information does not:

- Provide support for primary publications or monographs.
- Provide bibliographic or reference services or perform literature searches.
- Furnish copies of publications resulting from research sponsored by NSF or other organizations.
- Hire translators or perform translations of foreign publications.

Additional Information

Communications should be addressed to: Division of Science Information, National Science Foundation, Washington, D.C. 20550.

International Travel Grants

The National Science Foundation awards international travel grants to assist scientists to go abroad for one of the following purposes:

(1) Attending international scientific congresses and meetings;

(2) Obtaining or exchanging information in the areas of basic research, science education, science information or information relating to international scientific programs and associated activities;

(3) Cooperating in international scientific activities.

International travel is defined as all travel outside the United States and its possessions, Canada, and Puerto Rico.

NSF each year selects certain meetings, in areas of particular interest to the Foundation, for which participant support may be granted.

International travel grants made to individuals are based on, and normally limited to, the equivalent cost of jet-economy air transportation from the city where the traveler resides, or is employed, to his destination abroad and return. A per diem may be paid when an individual is traveling as a representative of the U.S. Government, an international organization, or a U.S. scientific organization functioning as a national member of an international organization. Travel must be by U.S. flag carriers, except in special circumstances.

Eligibility

Requests for international travel grants may be submitted by individual U.S. scientists or by nonprofit organizations (usually professional societies). When a request is submitted by an individual U.S. scientist, NSF form 192, Application for International Travel Grant, available from the Foundation, should be used.

Deadlines

Approximately 2 months are required to process requests, but those for travel to meetings should be submitted 4 months in advance because evaluation of requests normally occurs several months before the meeting date.

Additional Information

Communications may be addressed to the following: Directorate for Biological, Behavioral, and Social Sciences; Directorate for Mathematical and Physical Sciences, and Engineering; Office of Science Information Service; Office of International Programs; Division of Astronomical Sciences; Division of Atmospheric Sciences; Division of Ocean Sciences; Division of Earth Sciences; Office of Polar Programs; Directorate for Science Education; or Research Applications Directorate, National Science Foundation, Washington, D.C. 20550.

Scientific Conference Grants

The National Science Foundation awards grants to support conferences, symposia, and workshops held in the United States that bring together leading scientists who are pioneering in new or incompletely explored fields of science.

The Foundation does not provide support for regular meetings of scientific societies. Support for special conferences should be requested only if regular meetings of professional societies do not provide the necessary forum.

Eligibility

Proposals for support for scientific conferences may be submitted by U.S. colleges and universities, nonprofit research institutions, or scientific or professional societies. Concomitant support by several Federal agencies or private organizations is permissible.

Deadlines

Proposals for Scientific Conference Grants may be submitted at any time, but at least 6 months before the projected conference date.

Communications may be addressed to the following: Directorate for Biological, Behavioral, and Social Sciences; Directorate for Mathematical and Physical Sciences, and Engineering; Office of Science Information Service; Division of Astronomical Sciences; Division of Atmospheric Sciences; Division of Earth Sciences; Division of Ocean Sciences; Office of Polar Programs; Office of International Programs; or Research Applications Directorate; National Science Foundation, Washington, D.C. 20550.

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